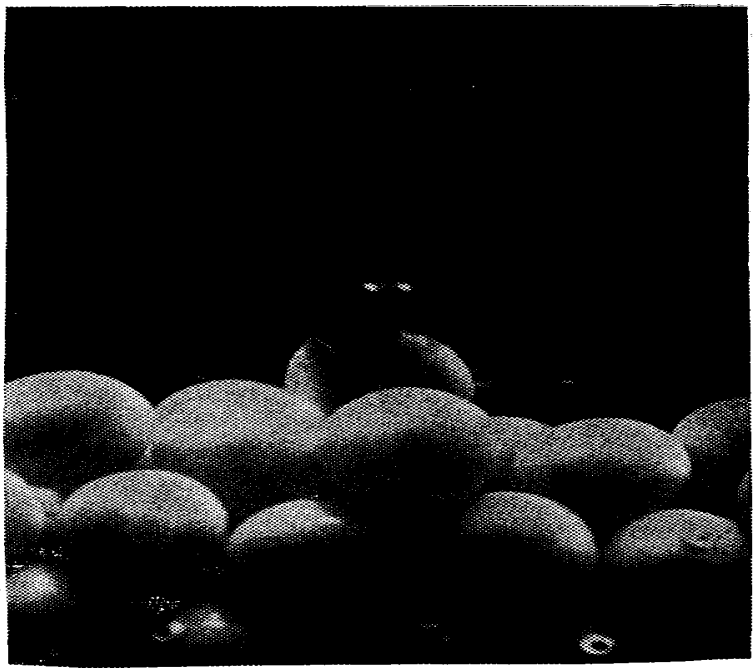
RESIDENT FISH HATCHERIES
ANNUAL REPORT

Period Covered: January 1, 1993 to December 31, 1993



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IDFG 94-30

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RESIDENT FISH HATCHERIES

2003 ANNUAL REPORT

Resident fish hatcheries reared and stocked over 1.38 million pounds totaling 18.4 million fish. More than 2,500 stocking trips were made to plant fish in over 500 waters.

Resident hatchery program costs were about $2.5 million for an average cost of $1.52 per pound or $0.16 per fish. Costs varied greatly between hatcheries. Sandpoint Hatchery had the lowest cost per fish at $0.027 and American Falls Hatchery had the highest at $0.45 per fish.

Rainbow trout of catchable size (8 to 11 inches) composed the greatest share of program costs at $1.2 million. The high cost of distributing catchables for stream stocking programs results in a cost per fish stocked of $0.54. Fingerling production costs averaged about $1.80 per pound.

Fish health was generally very good except at Hagerman and Clark Fork hatcheries. Because of the open water supply at these two facilities, combined with heavy bird predation at Hagerman, fish losses continue to be significant and unpredictable at these hatcheries.

A few construction projects were started at resident hatcheries during 1993. The Utah Power and Light money dedicated in 1992 to Ashton Hatchery was carried over. Ashton Hatchery finished installing a low head oxygen system with oxygen monitors, and the hatchery installed an air diffusion system to make the raceways self-cleaning.

Grace Hatchery had a new pipeline installed and money was made available for Hagerman Hatchery to replace their Tucker Springs head ditch with a pipeline also.

Nampa, Hagerman, and Clark Fork hatcheries worked on bird exclosures, with Nampa completing theirs during 1993.

Hayspur Hatchery replaced an old residence with a new modular home, installed isolation incubators, and plumbed a new well into their production water supply.

Several of the resident hatcheries invested time and money into self-guided tours of the facilities. Approximately 60,000 visitors toured resident hatcheries this year.

Three captive broodstocks were maintained, not including Hayspur Hatchery's normal stocks. Clark Fork maintained a captive westslope cutthroat broodstock, Cabinet Gorge maintained a captive Lake Pend Oreille kokanee stock, and Ashton Hatchery maintained a fluvial rainbow trout stock obtained from the Colorado River.

Idaho Department of Fish and Game
Resident Hatcheries Fish Production
01/01/93 - 12/31/93

Hatchery	Put-and-Take Number	Put-and-Take Pounds	Number	Pounds	Pounds	Feed Pounds	Feed Costs	Feed corner-sion	Total cost	Cost/ 1,000 fish	Cost/ pound
Hagerman	775,299	257,748	3,481,307	167,676	425,424	574,248	181,738	1.35	461,070	108.32	1.08
Nampa	475,356	150,559	773,395	32,762	183,321	276,606	92,145	1.4	265,283	212	1,348
American Falls	465,590	228,328	38,060	8,000	236,328	209,166	52,361	1.07	187,602	300.00	0.87
Mackay	222,140	109,790	3,743,326	30,533	140,323	112,131	36,709	1.02	206,652	52.10	1,879
Grace	194,264	20,552	1,239,874	65,611	86,163	113,200	36,475	1.3	173,850	121.00	2.02
Hayspur	156,345	62,552	238,245	7,440	69,992	196,146	55,261	2.08	178,300	451.00	2.55
Ashton	183,867	53,147	964,008	4,512	57,659	49,922	15,208	1.10	142,900	124.97	2.48
Cabinet Gorge	0	0	2,171,496	34,806	34,806	36,867	18,065	1.56	186,420	85.85	5.36
Clark Fork	5,681	4,563	430,939	26,879	31,442	65,659	30,837	2.09	68,000	155.74	2.16
McCall	0	0	241,600	3,711	3,711	352	528	1.88	49,286	204.00	13.31
Sandpoint	0	0	2,108,803	5,494	5,494	9,687	4,209	1.76	57,632	27.34	10.49
Clearwater	445,305	108,811	0	0	108,811	132,164	35,916	1.19	71,345	160.22	.66
TOTAL PRODUCED	2,923,847	996,050	15,431;053	387,424	1,383,474	1,776,148	559,452	1.28*	12,048,340	$167.06*	$1.52*

*Denotes weighted means.
Total cost for each hatchery is that hatchery's total budget minus capital outlay expenditures.

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

AMERICAN FALLS FISH HATCHERY

1993

Prepared by:

Gary Baker, Fish Hatchery Superintendent II
David Billman, Fish Hatchery Superintendent I
Todd Garlie, Fish Culturist

INTRODUCTION

American Falls Fish Hatchery is a resident fish hatchery located on approximately 120 acres of Idaho Department of Fish and Game (IDFG) land on the north bank of the Snake River, 1/2 mile below the American Falls Reservoir Dam. American Falls Hatchery is two miles by road from the town of American Falls.

The primary objective of the hatchery is to rear 150,000 lbs of catchable sized (9- to 12-inch) rainbow trout. American Falls Hatchery also produces fingerling (4- to 6-inch) rainbow trout as requested. The number and pounds of fingerling produced varies from year to year.

The hatchery is staffed by three permanent state employees. An eight-month temporary employee is usually hired for the planting season.

Funding for the hatchery operation comes from both license monies and from interest on an American Falls Irrigation District endowment.

The physical layout of the hatchery consists of 20 single pass 100 x 8 x 3 foot concrete raceways and a hatchery building containing 14, 21 x 4 x 2 foot concrete rearing vats.

Water for the hatchery comes from Reuger Springs located on the hatchery property. These springs flow an average of 20 cubic feet per second (cfs) at a constant water temperature of 55°F.

FISH PRODUCTION

American Falls Hatchery raised exclusively Hayspur strain (R-9) rainbow trout for the 1993 production year. This strain of fish performs extremely well at this facility.

A total of 272,244 Hayspur strain rainbow trout were carried over from 1992. These provided catchable fish for the 1993 stocking season.

Hayspur Fish Hatchery supplied 466,000 eyed eggs from December 1992 through March of 1993. Hatching success was 90% on these eggs.

Various state hatcheries received as transfers 151,090 catchable rainbow trout (69,350 lbs) from American Falls Fish Hatchery (Appendix A). American Falls Hatchery stocked 153,410 catchable rainbow trout (95,978 lbs) in area waters and 38,060 fingerling fish in Blackfoot Reservoir (8,000 lbs) (Appendix B).

Production on hand December 31, 1993 totaled 288,082 Hayspur strain rainbow trout (48,880 pounds). These fish will be stocked and transferred as catchable fish during the 1994 stocking season.

Costs for 1993 (less capital outlay) totaled $187,602. This includes $52,361 for fish feed purchases. Production costs overall were $0.87 per pound of fish produced, or $0.30 per fish.

HATCHERY IMPROVEMENTS

Maintenance and Repairs

1. The interior of residence number two was completely repainted.

2. Insulation and steel siding were installed on the old shop building.

3. The ceiling of the old shop building was insulated by the hatchery crew.

4. The gas engine for the irrigation pump that is used to irrigate the east end of the hatchery was replaced with an electric motor.

5. A new 80386 computer was purchased along with a laser printer.

6. The main hatchery sign was repainted.

Hatchery Needs

1. Metal siding is needed on the two garages that were built in the 1930s.

2. A tractor with a mower deck is needed to replace the old one.

3. A brush mower to fit the above tractor is also needed.

4. A mig welder is needed for repairing the aluminum feed delivery tubes.

5. An underground irrigation system is needed for the lawn areas.

6. New flooring is needed in the crews quarters bathroom and residence one kitchen.

7. A new roof is needed on residence two.

8. The old chain saw needs to be replaced.

FISH STOCKED OR TRANSFERRED

During 1993, 352,560 fish (166,978 lbs) were stocked or transferred to other hatcheries from American Falls Hatchery. Fingerling plants accounted for 38,060 fish (8,000 lbs) and catchable sized fish (9- to 12-inches) accounted for 314,500 fish (158,978 lbs). A total of 151,090 catchable rainbow (69,350 lbs) was transferred to other fish hatcheries. This amounted to 48% of total catchable production (Appendices A and B).

FISH FEED

During the 1993 production year, a total of 209,166 pounds of various sized fish feed was fed. All fish feed for the year was purchased from Rangen Inc. Total feed cost for the year was $52,361.41 ($0.25 per pound average). Conversion, overall, was 1.07 pounds of feed to pounds of fish weight gain. For a breakdown on feed sizes and coats for the year see Appendix C.

FISH HEALTH

American Falls Hatchery has a perennial problem with subacute to chronic Coldwater Disease (CWD), caused by Flexibacter psychrophilus, and 1993 was no exception. All three lots of Hayspur rainbow trout were given prophylactic treatments of oxytetracycline at first feeding, but with little or no positive response. Every lot experienced some losses within the first three months of production, with most mortality coming in response to the stresses of moving the fish to the outside raceways. Each lot received a second feed treatment of oxytetracycline after being moved. Chronic losses persisted throughout the rest of the year. The early prophylactic treatment will be discontinued in 1994. Hatchery personnel will concentrate on reducing stress in the move from the hatchery building and will use only oxytetracycline to treat active outbreaks of CWD.

It is possible that the CWD problem originates at Hayspur Hatchery; the source for all of American Falls Hatchery's rainbow trout eggs. Attempts to inhibit vertical transmission of the pathogen are continuing at Hayspur Hatchery with the use of oxytetracycline injections to the female broodstock. Other proposed control methods, which may be tested in the future, include water-hardening eggs in oxytetracycline and/or osmotic infusion of oxytetracycline into eyed eggs.

The resident fishery pathologist visited the hatchery twice; on July 20 and September 19. No sampling was done in July, as most fish had just received a treatment of oxytetracycline which would have had some effect on laboratory results. Routine inspection samples were taken in September from lot 93HAY, the fish which were destined for fall fingerling plants. No pathogens were detected (Appendix D). The remaining lots will be sampled prior to release in 1994.

Recommendations for the future include using a 3% salt bath prior or during the move from the hatchery building to the outside raceways to reduce moving stress, and reducing densities to reduce stress and possibly improve fin quality.

American Falls and Mackay hatcheries are the two facilities in the IDFG system with the fewest disease problems (both Class A "Quarantine" facilities). This can be attributed to the facility designs, the clean water sources, and to the professionalism of the hatchery personnel. The benefits of Class A status to the Department include more leeway for statewide redistribution, better survival of fish after stocking, and less contribution to the transmission of pathogens/diseases to wild or native fish populations.

GENERAL

The wetter than normal spring and summer of 1993 allowed the American Falls Hatchery staff to spend less than the usual amount of time moving irrigation handlines to keep the yards watered. It also provided a better carryover of water in many of the area reservoirs, thus improving fall and winter fishing.

Maintenance of the 9 acres of hatchery grounds still required much attention. Trees and shrubs were trimmed in the spring. Lawn mowing required approximately 12 man-hours per week during the period from April through October. Moving handlines during a normal dry week can require up to 20 man-hours.

The hatchery lawns were sprayed in the spring and fall to control broad-leafed weeds. Hemlock, a noxious weed, was also sprayed in the spring for control where possible. Power County Weed Control stops in yearly in the spring to remind us to spray this species. Some of the hemlock on hatchery grounds grows in the spring areas and cannot be safely controlled chemically. Mechanical control is advised for these areas.

The 500-gallon fish transport tank was removed from the one-ton truck and the exterior of the tank prepared for painting by the hatchery crew. It was later primed and spray-painted with two coats of paint. When the tank was replaced, the bolts were put through a length of angle iron on the underside of the truck deck. This was done to decrease the possibility that the bolts might pull through the deck during an emergency stop or crash.

The crew also built a trailer to move irrigation handlines around the fish hatchery grounds. This has proven to be a labor saver, as previously each length of handline had to be individually carried from one area to the next. Now they can be loaded and moved to the desired area in mass.

PUBLIC RELATIONS

American Falls Hatchery received an estimated 5,000 visitors this year. Most of the visitors consisted of public school groups which descended upon us from March through July. We also had scout groups, family reunions, bird watchers, as well as hunters and anglers who were pursuing their sports in the vicinity. Some people wandered in accidentally to discover the hatchery.

Free Fishing Day activities at American Falls Hatchery were sponsored by the American Falls Police Auxiliary in conjunction with IDFG. The activities were intended to introduce children to the sport of fishing. Approximately 150 children turned out with their parents to participate. Catchable rainbow trout were stocked in the old raceway at the upper end of the hatchery. The children were allowed to fish for a limit of two fish after some instruction on water safety, general fishing techniques, and care of fish after they are caught. All participants caught their limit and enjoyed the outing. Region 5 personnel helped to make the day a success.

ACKNOWLEDGEMENTS

Hatchery staff for 1993 included Gary Baker, Superintendent II; David Billman, Superintendent I; Kurtis Schilling, Fish Culturist; Todd Garlie, Fish Culturist; and Eric Strand, Bio-Aide.

Appendix A. Fish transfers, American Falls Hatchery, 1993.

Facility	Number	Pounds	Size (/lb.)
Clark Fork Hatchery	128,980	56,700	2.27
Mullan Hatchery	12,110	7,000	1.73
Grace Hatchery	10,000	5,650	1.77
TOTALS	151,090	69,350	2.18

Appendix B. Fish transferred or planted by region.

Region	Spp.	Numbers	Pounds	Destination
1	R9	151,090	63,000	Region wide
4	R9	17,210	9,000	Region wide
5	R9	87,461	57,987	Region wide
5*	R9	38,060	8,000	Blackfoot Reservoir
6	R9	58,739	28,991	Region wide
TOTAL		352,560	166,978	State wide

*Fingerling fish

Appendix C. Fish feed utilized, 1993 Production Year.

Brand Name	Size/Type	Pounds	Cost
Rangen	#1 Starter Medicated	200	113.43
Rangen	3/64 Soft Moist	352	229.01
Rangen	1/16 Soft Moist	704	463.24
Rangen	#3 Medicated	300	151.80
Rangen	3/32 Medicated	2,000	898.30
Rangen	3/32 Production	4,000	942.89
Rangen	1/8 Medicated	600	246.00
Rangen	1/8 Production	201,010	49,316.74
TOTALS		209,166	52,361.41

Appendix D. Summary report of Eagle fish Health Laboratory results for American Falls Hatchery (Class A), January 1 – December 31, 1993.

Brood Year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
1993	Hayspur	Rainbow	93-444	-	-		-	-	-	-						IX: Negative for pathogens; FAT 0/59, ELISA 0/60, BACTE NG, Viro 0/60

IHN Infectious Hematopoietic Necrosis virus
IPN Infectious Pancreatic Necrosis virus
EIBS Erythrocytic Inclusion Body Syndrome virus
BKD Bacterial Kidney Disease (Renibacterium salmoninarum)
RS Positive for Renibacterium salmoninarum but not clinical disease
FUR Bacterial Furunculosis (Aeromonis salmonicida)
ERM Enteric Redmouth Disease (Yersinia ruckeri)
CWD Coldwater Disease (Flexibacter psychrophilus)
PKD Proliferative Kidney Disease (PKX)
WHD Whirling Disease (Myxosoma cerebralis)
CSH Ceratomyxa shasta
ICH Ichthyophthirius multifilis
GBD Gas Bubble Disease

IX Inspection (routine hatchery visit)
DX Diagnostic (sampled because of sick fish)

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

ASHTON FISH HATCHERY

1993

Prepared by:

Michael A. Graham, Fish Hatchery Superintendent II
Mel Sadecki, Fish Hatchery Superintendent I

INTRODUCTION

Ashton Fish Hatchery is located in Fremont County, Idaho, approximately two miles southwest of the small community of Ashton. Constructed in 1920, and funded by fishing license dollars, Ashton Hatchery serves as a "specialty station," rearing nine species of trout and salmon, including rainbow trout, Colorado rainbow trout, rainbow/cutthroat hybrids, cutthroat trout, brook trout, brown trout, golden trout, grayling, Kamloops, and Atlantic salmon.

The majority of fish produced at Ashton are fry and fingerling (1 to 6 inches) that are distributed throughout Idaho as part of various put-grow-and-take management programs. Catchable size fish (9 to 10 inches) are also reared at Ashton and distributed locally in waters managed on a put-and-take basis.

FISH PRODUCTION

General Overview

A total of 1,143,433 fish (57,653 pounds) were produced at Ashton Hatchery this year, consisting of 964,008 fingerlings (4,512 pounds) and 183,867 (includes holdovers) catchables (53,147 pounds). The total number produced was up from last year, as was the total pounds produced (Appendix A). The majority of fish requests were met or exceeded (golden trout requests were not met because eggs were unavailable). Production cost (excluding capital outlay) was $142,900, with $15,208.22 spent on fish feed and the remaining $127,691.78 spent on general hatchery operations and personnel cost. The average cost per pound of fish produced was $2.48 (Appendix A).

All the fish reared at Ashton were received as eyed eggs (Appendix B). Kokanee were not spawned at Moose Creek in 1993 because of low numbers in Island Park Reservoir caused by low water years. Ashton was able to produce enough catchables to meet regional needs, so it was not necessary to bring in catchables from other hatcheries this year. The hatchery staff stocked 6,082 cull broodstock from Ennis National Fish Hatchery and 6,144 mackinaw from the Bozeman Fish Health Center (Appendix C).

All fry and fingerlings were fed by automatic belt feeders that dribbled feed into the tanks and raceways 8 to 10 hours per day. Human disturbance was kept to a minimum and conversions improved over hand feeding techniques.

Demand feeders were utilized for the first time in outdoor raceways for the catchables. Conversion improved from 1.33 in 1992 to 1.10 in 1993 (Appendix D). Waste settling areas were created in the lower 15% of the outside raceways, which served to settle fish waste for removal before it floated through the lower fish. Lights over nursery tanks were adjusted to a moderate intensity, and growth rates were maintained when the fish were moved outside by the use of automatic fry feeders and covers for the small raceways.

Grayling and cutthroat trout had the lowest monthly length increase among the fry and fingerling because these fish were stocked as small fry (Appendix D). The catchable rainbow had the highest monthly length increase. The holdover golden trout had the poorest conversion because of heavy infestation of gyrodactylus over an extended time, while the cutthroat had the best conversion.

The average survival for all fish was 76.8% from eyed egg to distribution. The Atlantic salmon had 30.4% survival due to poor quality eggs, and the brown trout had the best survival with 97.39% (Appendix D).

Catchable Rainbows

Ashton Hatchery produced and stocked 83,463 (33,704 pounds) 10-inch catchable rainbow for distribution into area lakes and streams (Appendix A). An additional 82,161 (17,224 pounds) of 8.4-inch holdovers were produced for stocking in 1994.

Water flows were down from 5.5 cubic feet per second (cfs) to 4.5 cfs during the spring months of heavy production. In order to maintain feeding rates for the catchables, supplemental oxygen had to be injected into the water. For this purpose, up to five Zeigler low head oxygen (LHO) boxes were mounted behind raceway damboards, with all available water channeled through them. Pure oxygen was injected into the boxes, which raised dissolved oxygen concentrations from 1 to 5 ppm. Oxygen transfer efficiencies of over 80% were achieved.

Golden Trout

Golden trout are being reared at Ashton primarily in an attempt to establish an Idaho spawning population at Baker Lake and for stocking several mountain lakes. A total of 840 (42 pounds) golden trout were transferred to Hayspur Hatchery. No source of golden trout eggs could be located for 1993. These fish had very poor conversion, probably due to their continued susceptibility to gyrodactylus (Appendix D) and low densities.

Grayling

Grayling survival continues to be good for such a small fish. This year, survival was 64.08% from eyed egg to stocking. Fry are so small that pantyhose must be placed over the tailscreen to keep them from slipping through the screen.

The average monthly length increase was .282, while the conversion was 1.12. Rindachi and Barrows (1989) reported that grayling fed Biokyowa feed during the first 14 days of their test had a survival of 81%. Grayling were fed Biokyowa B-250 and B-400 fry feed for the first three weeks at Ashton, then switched to Bio-diet semi-moist starter. This diet combination, although expensive, has been effective in *increasing* grayling survival at Ashton for the last several years, and will be continued again next year.

Colorado Rainbow Trout

A total of 17,916 eggs, taken from native Colorado River rainbow, were received from Glenwood Srpings Hatchery in April, of which 14,331 are still on hand. In addition, there are 3,285 8.4-inch Colorado fish being held for broodstock in 1994 or 1995. A total of 3,240 Colorado rainbow trout were stocked in the Buffalo River in the spring of 1993. All of these fish will be adipose-clipped for identification.

Eggs were collected from the South Fork of the Rio Grande over a 20-mile reach from Hot Sulfur Springs to Kremling, Colorado in an area where no

supplemental stocking has occurred in the last 20 years. Eggs were taken from females 14 to 20 inches long (14- to 15-inch average), while milt was taken from males 11 to 20 inches long (12- to 16-inch average). Fish ranged in age from 4 to 7 years, but averaged 4 to 5 years. An approximate 1:1 spawning ratio was obtained by spawning 5 females with 5 to 7 males. Fecundity averaged 800 eggs per female.

These fish have had 8 years of disease workups with no pathogens detected. Catchables are stocked 5 miles upstream, but Colorado biologists feel that most of these were caught immediately. Whirling disease was detected in ponds upstream in the drainage.

HATCHERY IMPROVEMENTS

Utah Power Company gave Ashton Hatchery $110,000 in 1992 for hatchery improvements and to rear 22,000 Hayspur rainbow trout yearly for stocking in Ashton Reservoir as mitigation for the Ashton Dam and power plant. This past year, the money was used to purchase equipment for the oxygen monitoring system, the air cleaning blower system, the oxygen injection system, and a new fish pump.

This year most of these systems were installed and made functional. The oxygen monitor system consists of the OxyGuard oxygen monitor, remote oxygen probes, and Simplex telephone alarm dialer. The Oxygaurd monitor is able to constantly scan the dissolved oxygen at eight sites. A display monitor is located in the hatchery office, which gives a direct readout of dissolved oxygen in the raceways. The 8 probes are wired to any of 16 locations. If oxygen concentrations should drop to minimal levels while the hatchery personnel are away from the station, the automatic dialer will telephone each residence with a recorded warning. If no one responds to the alarm, the dialer will call the Henrys Lake Hatchery.

The air cleaning blower system was made operational this year. It consists of a blower and peripheral piping. The blower produces low pressure, high volume air to the peripheral piping system. The piping is divided between distribution pipes and perforated cleaning pipes and associated valves. The distribution pipes and valves deliver air to each individual section of raceway, then the perforated pipe is placed in the bottom of each occupied raceway, where the stream of bubbles keeps waste materials suspended until it reaches the settling zones at the lower ends of the ponds.

The piping for the oxygen injection system was installed this year by contractors. The system includes a 500-gallon storage tank, valves, regulators and LHO boxes. Since the installation of the injection system, Ashton is able to produce more pounds of catchables (33,704 pounds in 1993 vs 18,278 in 1992). Oxygen increases of up to 5 ppm are possible with the system.

Additional needs include a new hatchery outlet structure, repairing the entrance road, building a large storage area and heated garage east of the quonset hut, and putting a new metal roof on the three-car garage.

FISH HEALTH

Ashton Hatchery was visited twice in 1993 by pathologists from the Eagle Fish Health Laboratory. Kent Hauck, Fish Pathologist Supervisor, did a routine inspection in April to check the brook trout, brown trout, rainbow trout, Kamloop trout, golden trout, and Atlantic salmon. No pathogens were detected (Appendix E). Doug Burton, the new Resident Pathologist, was on station for another

inspection on September 21, when he was advised of an increase in mortality among the Henrys Lake brook trout. Initial necropsy showed badly occluded gills, anemia, and petechial hemorrhage in the body cavity of one fish. Bacterial and viral samples were taken to the lab for analysis. Aeromonas salmonicida, the causative agent of furunculosis, was identified from 11 of 12 fish sampled. Clinical signs consistent with furunculosis had also begun to appear while the laboratory work was in progress. A 5-day treatment of Romet-30 at 50 mg/kg/day was administered in the feed, and was effective in controlling the epizootic, but not until approximately 46,000 fish (29%) were lost. Aeromonas salmonicida was isolated from Henrys Lake brook trout broodstock in 1990 (Eagle Fish Health Laboratory database, Accession 90-272). Incomplete disinfection of eggs or equipment was likely the original source of the pathogen at Ashton Hatchery. Stress from environmental/bacterial gill disease may have then initiated the outbreak of furunculosis. The gill problems may have been somehow related to the new air cleaning system which was in use for the first time, although other species reared on the system did not seem to be effected. Brook trout may be less tolerant to continually suspended organic wastes or to some other component of the new operation than the other species. Two other possible stressors were new concrete in the raceways, and the high spring runoff following several years of drought which may have infused higher-than-usual levels of organics, agricultural chemicals, or other contaminates into the spring water.

The Colorado River rainbow trout were also sampled in September because of a slight rise in mortality rate. These fish were negative for significant pathogens, although they were diagnosed with a multiple parasitism of Gyrodactylus and fungi (Rhodotorula, Exophiala, and another yeast which has yet to be identified). The mortalities returned to normal as water temperatures cooled without the need for a chemical treatment.

The only other significant health problems at Ashton Hatchery are the recurring infestations of Gyrodactylus which primarily effect the golden trout and the rainbow trout. The parasite has been controlled with formalin treatments, following FDA approved protocol. However, the point of concern is the uncertain long-term effect of repeated exposure to a harsh chemical on a delicate (and highly inbred) species like golden trout. There is undoubtedly a reservoir for the trematodes in the spring or pipeline which needs further investigation and, if possible, elimination.

Ashton Hatchery is currently classified as a Class B Isolation facility. This is desirable in that it allows Ashton to ship eggs or fish to other Class B hatcheries. This classification may be put in jeopardy if eggs received at Ashton should ever prove to carry certifiable pathogens. The fact that more diseases have not turned up at Ashton is more likely due to the management efforts of the hatchery personnel than to an attempt to exclude pathogens from the facility. Three recommendations to maintain this classification, as well as the quality of fish health at Ashton, are:

1. Be stringent in requiring disease certification from outside egg sources or consider reducing the importation of multiple stocks into the facility.

2. Use the most rigorous disinfection protocols practical on the hatchery and at Henrys Lake.

3. Intensify our efforts to identify and possibly cull contaminated eggs from Henrys Lake before transferring them to Ashton.

FISH STOCKED AND TRANSFERRED

Ashton Hatchery's stocking program remained similar to last years program, with only minor changes. Hayspur rainbow trout eggs were received again, and Ashton will be using this strain for fingerling and catchable requests in the future instead of eggs from Ennis National Fish Hatchery (Appendix B). Hayspur strain rainbow trout have been requested for stocking in Ashton Reservoir every year. Kamloop eggs were received again from Black Canyon Trout Farm.

Grayling were transferred to Sawtooth, Clark Fork, Mackay, and McCall hatcheries, while brown trout were transferred to Hagerman (Appendix C). In addition, 6,082 unspecified rainbow were transferred from Ennis, as well as 300 Arlee rainbow trout broodstock, and 942 Kamloop broodstock. There were 6,144 mackinaw transferred from Bozeman National Fish Hatchery.

FISH SPAWNING

After six consecutive years of dwindling kokanee runs caused mostly by drought and subsequent lowering of water levels in Island Park Reservoir, no fish were observed in Moose Creek prior to the normal trapping date. Consequently, for the second time in seven years, the kokanee fish trap was not run in Moose Creek. Eggs from early spawning kokanee at Deadwood Reservoir were reared at Cabinet Gorge and some kokanee were released into Island Park Reservoir.

The crew spent several trips to Henrys Lake to assist in sorting and spawning cutthroat, rainbow hybrids, and brook trout.

FISH FEED

A total of 49,922 pounds of fish feed were fed to produce 44,808 pounds of gain, for an average conversion of 1.11:1 (Appendix F). All fish, with the exception of the grayling, were initially fed Bio-Diet because of the superiority and performance of the feed. No Rangen's Soft-Moist was fed this year. Grayling were fed Bio-Kyowa B-250 and B-400 as fry, because of their small size, and then switched to Bio-Diet. Catchable and holdover rainbow were switched to less expensive Rangen's dry diet when they reached fingerling size, while other varieties were fed Bio-Diet until they were stocked.

PUBLIC RELATIONS

Approximately 3,500 people visited Ashton Hatchery this past year. About 1,200 elementary students from as far away as Idaho Falls visited the hatchery last spring, summer, and fall. Our visitor information center answers questions about the hatchery, fishing and hunting regulations, and various Idaho Department of Fish and Game policies. A color-coded pamphlet is designed to show where hatchery fish are stocked and listed reasons for limit changes in the Henrys Fork.

Fishing was again allowed in the hatchery settling pond for kids 12 and under on Free Fishing Day. The Forest Service provided signs and refreshments, and four personnel assisted the hatchery crew in showing the kids how to fish. Region 6 fishery personnel provided bait, hooks, bobbers, and fishing poles for the event, while conservation officers help teach ethics and laws to the kids. Ralph Moon, world renowned fly fisherman, gave lessons on fly tying and fly fishing. About 225 kids took advantage of free fishing and nearly all caught

fish. The average size of the fish caught was 2 pounds with a few larger fish taken.

Fishing was also allowed on another weekend for physically and mentally handicapped kids. About 30 handicapped anglers took part in fishing and everybody caught fish. They cleaned their fish at the hatchery and had a fish fry at the Warm River Campground.

FIN CONDITION

In 1991, Ashton Hatchery personnel devised a qualitative way to measure hatchery fish fin condition. The technique, "The Ashton Method," compares pectoral and dorsal fin lengths of hatchery fish with those of wild fish to get a percent figure, or a fish fin factor. The higher the fin factor, the better the fish fins. The fin factor of a wild fish is .13 (.13 inches of fin length per inch of fork length).

The fin factor at Ashton Hatchery for this year was 50.8, or hatchery fish fins were 50.8% of wild fish fins. Measurements of 20 catchables at 5 times from different raceways prior to stocking resulted in fin factors of 48, 56, 54, 46, and 50 for an average fin factor of 50.8. This compares to fin factors 66 in 1992 and 69 in 1991. The lower fin factor for 1993 probably was the result of raising more pounds of fish with higher densities.

SPECIAL PROJECTS

Fish Marking

All the golden trout were marked with a left ventral clip before they were transferred to Hayspur Hatchery. This mark will identify the 1993 year class for spawning at Baker Lake.

Broodstock Hauling

Ashton Hatchery personnel were again involved in the mid-winter transport of broodstock culls from Ennis National Fish Hatchery. Ennis is primarily an egg taking facility, and excess spawners are hauled to lakes and rivers in Idaho. This year, 942 Kamloops (24 inches long) were transported to the Henrys Fork at Macks Inn, an additional 300 (23 inch) Arlee rainbow were stocked in Rexburg Pond and Robert's Pond.

Regional Efforts

Hatchery personnel taught the archery section of hunters education and assisted with firearms training in Ashton. Personnel also help to run the check station. Ashton personnel also ran the Free Fishing Day program here at the hatchery.

LITERATURE CITED

Kindschi, Greg A. and Frederick T Barrows. 1989 Diets for the Intensive Production of Montana Arctic Grayling. U.S. Fish and Wildlife Service, Bozeman Fish Technology Center, Bozeman.

Appendix A. Fish production and cost.

Species	Size	No. fish	Weight	Cost/lb	Cost/fish	Total cost
Fingerlings produced and stocked						
R9	3.0	62,784	463	8.14	.06	3,767
R10	5.0	3,240	108	3.90	.13	421
RC	2.0	8,552	36.2	21.27	.09	770
GR	.7	2,300	1	161.00	.07	161
C3	2.0	26,190	57.7	36.28	.08	2,095
BN	2.3	210,130	902	16.30	.07	14,709
BK	3.2	117,695	1,569	5.25	.07	8,238
K3	3.0	133,000	760	12.25	.07	9,310
Totals/avg.		563,891	3,896.9	10.13	.07	39,471
Holdover fingerlings						
R10	2.7	14,473	99	20.47	.14	2,026
BN	1.2	37,855	100	49.29	.13	4,921
K1	1.3	115,749	80	159.15	.11	12,732
R9	1.0	90,150	120	75.13	.10	9,015
Totals/avg.		258,227	399	77.39	.12	30,881
Catchables produced and stocked						
R9	10.0	83,463	33,704	.92	.37	30,881
AS	8.0	2,088	360	2.61	.45	940
BK	8.0	4,143	739	2.52	.45	1,864
Totals/avg.		89,694	34,803	.97	.38	33,685
Fingerlings transferred to other hatcheries						
BN	1.8	109,810	153.5	64.38	.09	9,883
R9	3.4	1,047	14	10.43	.07	146
GR	.8	30,263	6.5	419.44	.07	2,718
GN	5.1	840	42	9.00	.45	378
Totals/avg.		141,960	216	60.77	.09	13,125
Catchables produced for 1994						
AS	6.7	4,215	450	4.03	.43	1,812
R10	8.4	3,285	670	2.19	.45	1,465
R9	8.4	82,161	17,224	1.43	.30	24,648
Totals/avg.		89,661	18,344	1.52	.31	27,925
GRAND TOTAL		1,143,433	57,658.9	2.48	.12	$142,900

Appendix B. Eggs and fish received and transferred during 1993.

Species Species	Eggs received	Fish received	Fish transferred	Destination
AS	4,000	0	0	
BK	299,305	0	0	
BN	37,855	0	73,950	Grace
			35,860	Hagerman
R9	90,150	0	1,047	Jamie Holm
R10	17,916	0	0	
K1	115,749	0	0	
GR	70,000	0	4,047	Sawtooth
			5,505	Clark Fork
			2,850	Mackay
			17,841	McCall
C3	30,000	0	0	
RC	10,000	0	0	
GN	0	0	840	Hayspur
Total	674,975	0	141,960	

Appendix C. Origin of fish stocked or transferred in 1993.

Species	Source	Eggs	Fish	Destination	Stocked	Transferr	Size (in)
R1	Ennis NFH	-----	5,932	Region 6	5,932		3
R1	Ennis NFH	-----	150	Region 6	150		12
R9	Hayspur	*306,329		Region 6	83,463		10.2
R9	Hayspur	*306,329		Region 6	62,784		3
RA	Ennis NFH	-----	1,368	Region 6	1.368		23
MA	Bozeman	-----	6,144	Region 6	6,144		8
K1	Ennis NFH	-----	942	Region 6	942		24
R10	Glenwood Springs, CO	11,620	-----	Buffalo R.	3,240		5
BN	Saratoga, WY	*140,038	-----	Snake R. Am. Falls	210,130		2.3
BK	Henrys Lake	222,749	-----	Henrys Lake	121,588		5.8
AS	Wizard Falls, OR	*12,672	-----	Deadwood Reservoir	2,088		8
K3	Black Cay	130,092	-----	Ririe Res.	133,000		3
BN	Dubois	*188,454	-----	Grace	-----	73,950	1.2
BN	Dubois	*188,454	-----	Hagerman	-----	35,840	2.4
GN	Daniel, WY	*864	-----	Hayspur	-----	840	5.2
GR	Daniel, WY	80,000	-----	Sawtooth	-----	4,047	.8
GR	Daniel, WY	80,000	-----	Clark Fork	-----	5,525	.8
GR	Daniel, WY	80,000	-----	Mackay	-----	2,850	.8
GR	Daniel, WY	80,000	-----	McCall	-----	17,841	.8
R9	Hayspur	*306,329	-----	Jamie Holm	-----	1,047	3.4
C3	Henrys Lake	30,000	-----	Region 6	26,190		2.0
RC	Henrys Lake	10,000	-----	Region 6	8,552		2.0
Total Stocked or Transferred					665,571	141,940	

* Received prior to 1993.

Appendix D. Comparative growth rates, feed conversion and percent survival for all species reared at Ashton Hatchery, 1993.

Species	Average monthly length increase	Average conversion	Percent survival
rainbow (catch.)	.549	1.10	85.1
rainbow (fing.)	.399	1.31	97.9
brook trout (catch.)	.432	1.14	92.0
brook trout (fing.)	.387	.84	64.1
brown trout	.291	1.11	97.4
Kamloops	.363	.99	97.0
grayling	.282	1.12	64.6
cutthroat	.245	.80	81.8
rainbow x cutthroat hybrids	.363	1.34	82.4
Atlantic salmon	.420	1.36	30.4
golden trout	.309	4.48	52.9
Holdover for 1994 stocking			
rainbow	.555	1.10	
Atlantic salmon	.453	1.15	
Colorado rainbow	.420	1.52	

Appendix E. Summary report of Eagle Fish Health Laboratory results for Ashton Hatchery (Class B), January 1 - December 31, 1993.

Brood year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
1992	Henry L	Brook	93-106	-	-											IX: Negative for pathogens; Viro 0/15
1992	Sarat	Brown	93-107	-	-											IX: Negative for pathogens; Viro 0/60
1992	Wiz Fl	Atl sal	93-108	-	-											IX: Negative for pathogens; Viro 0/10
1992	SulvLk	Golden	93-109	-	-											IX: Negative for pathogens; Viro 0/10
1992	Blk Cn	Kamloop	93-124	-	-											IX: Negative for pathogens; Viro 0/5
1991	Haysp	Rainbow	93-125				-									IX: Negative for pathogens; ELISA 0/20
1993	Henry L	Brook	93-446	-	-			+	-	-						DX: Furunculosis, MAS Viro 0/15, Aeromonas salmonicida, Aeromonas hydrophila
1992	Col Riv	Rainbow	93-447	-	-		-	-	-	-						DX: Mult. parasitism; Gyrodactylus, Rhodotorula, Exophiala Viro 0/10, ELISA 0/10, FA 0/10, Bacte 0/8

IHN Infectious Hematopoietic Necrosis virus
IPN Infectious Pancreatic Necrosis virus
EIBS Erythrocytic Inclusion Body Syndrome virus
BKD Bacterial Kidney Disease (Renibacterium salmoninarum)
RS Positive for Renibacterium salmoninarum but not clinical disease
FUR Bacterial Furunculosis (Aeromonas salmonicida)
ERM Enteric Redmouth Disease (Yersinia ruckeri)
CWD Coldwater Disease (Flexibacter psychrophilus)
PKD Proliferative Kidney Disease (PKX)
WHD Whirling Disease (Myxosoma cerebralis)
CSH Ceratomyxa shasta
ICH Ichthyophthirius multifilis
GBD Gas Bubble Disease

IX Inspection (routine hatchery visit)
DX Diagnostic (sampled because of sick fish)

ASHAPP

Appendix F. Feed use.

Size	Source	Pounds	Cost/lb	Total Cost
#1 moist	Bio-Products	176	.93	163.68
#2 moist	"	352	.93	327.36
#3 moist	"	572	.93	531.96
1.0 moist	"	440	.70	308.00
1.3 moist	"	396	.659	260.96
1.5 moist	"	1,628	.659	1,072.85
2.5 moist	"	1,408	.614	864.51
3.0 moist	"	484	.614	297.17
4.0 moist	"	264	.614	162.09
1.0 dry	"	200	.40	80.00
1.3 dry	"	300	.40	180.00
1.5 dry	"	100	.375	37.50
#2 dry	Rangens	100	.444	44.40
#3 dry	"	600	.444	266.40
#4 dry	"	1,000	.2978	297.80
CC dry	"	700	.2978	208.46
3/32 dry	"	4,200	.2432	1,021.44
1/8 dry	"	12,800	.2432	3,112.96
5/32 dry	"	24,100	.2432	5,861.12
5/32 dry float	"	100	.2856	28.56
B-400	Biokyowa	2.2	36.82	81.00
Total		49,922.2		$15,208.22

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

CABINET GORGE FISH HATCHERY

1993

Prepared by:

Brent R. Snider, Fish Hatchery Superintendent II
Bruce Thompson, Fish Hatchery Superintendent I

INTRODUCTION

Cabinet Gorge Hatchery is located in Bonner County, Idaho approximately eight miles southeast of the community of Clark Fork. Constructed in 1985, the hatchery produces advanced-stage late-spawning kokanee salmon fry for Lake Pend Oreille. These fry are needed to mitigate for the loss of wild kokanee recruitment caused by hydroelectric power projects on the Pend Oreille watershed. The hatchery times the kokanee fry release to coincide with the altered cycles of zooplankton blooms in the lake caused by Mysis shrimp.

Staffing at the hatchery includes two permanent personnel, one temporary year-long maintenance craftsman, eight months of bio-aide time, and 17 months of temporary laborer time. Housing accommodations include two residences for the permanent staff and crew quarters for two seasonal employees.

Water Supply

Cabinet Gorge Dam is located about one mile upstream from the hatchery. After the dam's completion in 1952, artesian springs appeared along the Clark Fork River at the present site of the hatchery. The hatchery uses six pumps to exploit these springs. Two separate well fields provide up to 20 cubic feet per sectond (cfs) of well water to the hatchery. The lower spring and the upper well field water temperatures vary inversely over a 12-month period. A mixture of the two water sources allows incubation and feed training water to be kept around 50^{o}F (range 48^{o}F to 51^{o}F). Production water ranged from 39^{o}F to 51^{o}F.

Rearing Facilities

Rearing facilities at the hatchery include 192 upwelling incubators and 64 concrete raceways. The incubators are 12 inches in diameter by 24 inches high with a capacity of 110,000 kokanee eggs each. The 64 concrete raceways have a total rearing space of 32,000 cubic feet. Approximately one-third of each raceway is enclosed by the hatchery building. The adult kokanee holding area consists of two holding ponds (10 ft x 30 ft each) at the head of the fish ladder, and additional adult holding is available in three holding ponds (10 ft x 30 ft each).

PRODUCTION

Between January 1, 1993 and December 31, 1993, Cabinet Gorge Hatchery released or had on hand a total of 2,171,496 fish weighing 34,806 pounds remaining from the 1992 production year. A total of 36,867 pounds of fed produced 23, 581 pounds of gain for an overall conversion of 1.56. Average cost per pound of feed was $0.49, resulting in a feed cost per pound of fish of $0.76. Total production cost (less capital outlay) was $186,420 resulting in a cost per pound of fish of $5.36 and $85.85 per thousand fish (Appendix A). In addition, 9,144,000 Lake Pend Oreille kokanee eggs and newly hatched fry from the 1993 fall spawn were on hand December 31, 1993.

Lake Pend Oreille Kokanee

General Rearing

Fertilized eggs were brought to the hatchery building and disinfected in 100 ppm Argentyne for 15 minutes. After enumeration by volumetric displacement, the green eggs were rolled in the upwelling incubators. At eye-up, the flow through the incubators was increased to maintain the egg rolling. Five days after hatch the fry were sorted with slotted screen to remove infertile eggs and dead matter. Swim-up fry were allowed to swim out of the incubators into the raceways at 1,650 temperature units. Feed training began at 1,670 temperature units.

Kokanee were fee-trained at 50^{o}F using Rangens soft-moist starter for the first week, then this feed was mixed with Bio-Products Bio-Diet Starter #3. After this initial feed training, the fish were reared on Bio-Products Bio-Diet Grower 1.0 to 1.3 mm pellet depending on fish release size objectives. These size objectives have changed from 1.3-inch fry when the hatchery began operation, to the present request of 2.2-inch fry at release. To meet this request, the hatchery capacity has been reduced from 30 million to 16 million fry.

Because egg collection lasts over two months and a cross-section of the run is required for each release strategy, growth rates are adjusted according to release timing. The growth rates of the early egg takes are slowed by decreasing the water temperature. The late egg take growth is increased by raising the water temperature and the feeding rate. By adjusting these parameters after the fry are feed-trained, a representative sample can be obtained from each egg take, thus assuring optimum genetic diversity in each release.

A total of 621,506 kokanee fry were produced at an average length of 2.4 inches and an average weight of 243.9 fish per pound. These fish gained 2,213 pounds from 3,085 pound of feed, resulting in a conversion rate of 1.39:1.0. Fish feed production cost was $0.753 per pound and $2.68 per thousand.

Survival of green eggs to feeding fry was estimated at 14% (1992, 91%). Survival from first feeding to release was estimated at 52% (1992, 92%), resulting in survival from green egg to release of 8% (1992, 84%).

The poor kokanee survival for the 1993 production is attributed to the loss of incubation water. The failure of the back-up generator to start during a power outage December 23, 1992 caused the incubating eggs to be without flowing water for 20 minutes.

Fish Marking

The 1993 release group had run-represented sample groups fin-clipped. A total of 70,000 Sullivan Springs released kokanee were marked with an adipose fin clip.

Fish Liberations

A total of 561,146 kokanee fry were transported from Cabinet Gorge Hatchery to Sullivan Springs. The remaining 60,360 kokanee were held at the hatchery for use in the broodstock program. Numbers at release were based upon partial inventory numbers and raceway consolidation estimates made after mortality rates

stabilized. All numbers were checked with a weight/sample count number as the fish were loaded onto the trucks for Sullivan Springs. No fish were released at the hatchery ladder.

Kokanee were imprinted with a morpholine drip of 5x10-5 ppm for 30 days prior to release and for two days after release.

Sullivan Springs

All kokanee fry were released at Sullivan Springs. The releases were at both bridges on Sullivan Springs. Clark Fork Fish Hatchery provided a 2-ton truck and a 1-ton truck for transporting the fry. A pool in the stream was scoured out below the upper bridge for the 1-ton truck releases. The 2-ton truck released fry below the lower bridge using a 30-foot length of 10-inch plastic hose to provide a soft release. The four releases occurred July 15-16, 1993.

Other Fish Produced

Lake Pend Oreille Broodstock Kokanee

In 1989, an experimental kokanee broodstock program was started at Cabinet Gorge Hatchery. These kokanee are being held as a captive broodstock to enhance declining kokanee populations in the lake.

Kokanee (1989 BY)-There were 2,000 brood year 1989 kokanee remaining on January 1, 1993 following the 1992 spawning. None of these survived to spawn in 1993. From the 1992 broodstock spawn collection of 227,655 green eggs 8,900 fry survived and were released in 1993.

Kokanee (1990 BY)-About 1,225 brood year 1990 kokanee averaging 11.2 inches were on hand December 31, 1993. These were all spawned by the end of January 1994. The final spawn numbers are 298 females yielding 137,772 green eggs. At spawning the fish averaged 11.2 inches in total length and 2.1 fish per pound.

Kokanee (1991 BY)-There were 21,561 brood year 1991 kokanee averaging 8.02 inches and 5.1 fish per pound on hand December 31, 1993.

Kokanee (1992 BY)-There were 44,399 brood year kokanee averaging 5.2 inches and 23.8 fish per pound on station December 31, 1993.

Bull Trout

A bull trout culture program was established at Cabinet Gorge Hatchery in 1987 to advance the knowledge of bull trout culture and provide bull trout fingerlings to fisheries managers for reestablishment or enhancement of suppressed populations in Idaho. However, because of concerns about adversely affecting the genetics of the wild population in the lake with the introduction of hatchery fish from a limited number of parents, plus the unknown predator/prey relationship, this program was discontinued in 1991. The remaining bull trout

were held for rearing to 10 inches of larger. These fish were released in mountain lakes as a predator to reduce stunted brook trout populations.

1990 Bull Trout-On January 1, 1993, there were 3,813 bull trout on station. Of these, 2,863 fish survived to be released in selected mountain lakes across Idaho. The released fish averaged 11.5 inches in total length and 1.8 fish per pound.

Deadwood Kokanee

On January 1, 1993, there were 1,924,753 early-spawning Deadwood kokanee on station. Of these 546,627 fry were released in selected lakes and reservoirs across Idaho. The released fish averaged 2.4 inches and 236.4 fish per pound.

Colorado Kokanee

On January 1, 1993, there were 294,250 late-spawning Colorado kokanee on station. This stock was severely impacted by the power outage, with 15,332 fry surviving to plant into Lucky Peak Reservoir. The average stocking length was 2.1 inches at 359 fish per pound.

Hayspur Rainbow Trout

On January 1, 1993, there were 1,083,000 rainbow trout alevins from Hayspur Fish Hatchery on station. In May and July, 876,857 fry were transferred to Hagerman State Fish Hatchery. The fish averaged 2.5 inches in total length and 161 fish per pound.

HATCHERY IMPROVEMENTS

Improvements include:

- Erected a spawning shelter at the Clark Fork River fish trap.
- Added pump #8 to back-up generator.
- Carpeted the office and dormitory.
- Provided access to pumps for service vehicles.
- Mounted stationary ladders on the headbox.
- Relocated the alarm system batteries.

Repairs include:

- Returned pump #3 to service with necessary adjustments.
- Rebuilt pump #5 motor, line shaft, line bearings, and packing glands.
- Rebuilt pump #6 pressure relief valve.
- Replaced Granite Creek trailer floor.
- Repaired drop structures in Sullivan Springs.
- Replaced carpet in Residence #1.
- Serviced back-up generator, replaced batteries and needed accessories.
- Repaired pump #8 back-flow valve.

Methods used include:

- Developed daily, weekly, and monthly checks of back-up generator and related alarms.

HATCHERY RECOMMENDATIONS

The limiting factor in fish growth remains inadequate amounts of warm water (50^{o}F) during the production months. The upper well field yields up to 20 cfs during the production cycle, however the water is too cold for incubating and feed training. Warmer water from the lower springs wells must be added to temper the upper field water. The 4.4 cfs available from the lower springs well is insufficient to effectively temper the upper well field. A new well field intermediate in temperature is needed.

The adult ladder and holding ponds are operated with reuse water from the hatchery through the settling pond. An effective intermediate well field would free the lower springs wells to provide clean, cool water to operate the fish trap. An adequate degassing tower would be needed in addition to some added plumbing.

The fish loss of 1993 demonstrated the vulnerability of rearing fish with pumped water. An additional water backup is needed to further reduce the likelihood of a repeat water pumping failure. Options to consider include an additional backup generator, a direct power line from the hydropower dam and a water storage system to provide gravity flow water for a given length of time.

FISH HEALTH

IDFG Fish Health Laboratory personnel conducted all of the fish examinations and Doug Burton, Fish Pathologist, made the following comments.

From a fish health perspective, 1993 was an unfortunate year at Cabinet Gorge Hatchery. First, the kokanee fry which survived the initial power outage/water loss disaster continued to experience elevated mortality rates during early rearing. These groups were sampled repeatedly from January through April for virology and histopathology (Appendix B). The fish were too small to sample for standard bacteriology or fluorescent antibody techniques. No viruses were detected at any time, but the initial histologic examination detected coagulated yolk, muscular edema, gill hyperplasia, kidney degeneration and abnormalities in the swim bladder (including exogenous debris within the bladder). the diagnosis was environmental stress which caused coagulated yolk disease and toxicity, with secondary environmental gill disease and swim bladder problems. Subsequent samples showed an obvious progression of the above afflictions. Treatment for the gill disease may have helped in the short-term, but the best lessons learned were to avoid the initial dewatering at all costs and to refrain from aggravating some of the resulting problems.

Next, the bull trout began to have elevated mortalities in June and July. many demonstrated external lesions with mild hemorrhage that did not extend into the underlying muscle tissue. Samples were sent to the Eagle Fish Health Laboratory where motile Aeromonas and Pseudomonas species were isolated. It is possible that the bacteria were secondary invaders following stress and injuries from unconventional fish behavior related to conventional fish culture practices. One of two 3-fish pools were also positive (low) for Renibacterium salmoninarioum (RS) by ELISA.

Valuable lessons were learned in how to culture wild bull trout which should be documented for use if the Department ever decides to rear them again. One recommendation would be to sample the broodstock to evaluate the incidence of bacterial kidney disease (BKD) in the population before placing them in a hatchery. This might answer the question of whether the above fish were infected vertically with RS or whether they were later exposed in the hatchery.

Finally, the 1990 brood year kokanee, held on station as captive broodstock, were diagnosed in August with clinical BKD and the 1991 brood year fish were diagnosed as carriers. Clinical signs were later observed in the brood year 1991 fish.

The presence of clinical BKD lowers the Cabinet Forge Hatchery disease classification from a Class A "Quarantine" facility to a Class C. It will require the removal of the infected fish, disinfection of the facility, and three years of negative sampling results before the hatchery can be reclassified as "A." The significance of this lower classification is that Cabinet Gorge cannot ship eggs or fish to other Class A or B hatcheries without reducing the classification of the receiving facilities. Stocking of fish from Cabinet Gorge is also now restricted to waters which have historically had RS.

Inspection of the kokanee returning to Granite Creek and to the hatchery ladder also provided some disturbing information. All fish were negative for viruses and the Granite Creek fish were negative for BKD. The fish returning up the Clark Fork River to the hatchery ladder tested positive for BKD by both FAT and ELISA. The fish sampled from Granite Creek and the Clark Fork River were essentially the same fish when released from the hatchery. There must be some factor following releases, perhaps in the Clark Fork River, which is causing a higher rate of infection to occur. This situation definitely deserves investigation because BKD may be adversely effecting survival of kokanee in Lake Pend Oreille, and because presence of the disease will prevent Cabinet Gorge Hatchery from being reclassified as mentioned above.

Immediate recommendations for Cabinet Gorge Hatchery are to phase out the captive broodstock program, then fully disinfect the hatchery. The original purpose of Cabinet Gorge Hatchery is to rear Lake Pend Oreille kokanee. Therefore, we may need to initiate a BKD management program which will include isolation of Granite Creek fish from Clark Fork River fish and the use of chemical therapies. Investigational New Animal Drug (INAD) permits are in place for the use of erythromycin at Cabinet Gorge, and the Eagle Laboratory pathologists have begun the application process to test enrofloxacin on the 1991 captive brood fish.

FISH SPAWNING

Fish Trapping

During 1993, the Clark Fork River fish trap was in operation from October 15 to the last week of December. Kokanee began entering the trap immediately, with the last kokanee trapped and spawned on December 20. There were 49,187 fish trapped, with sampled counts indicating 29.4% of the spawning run was female (14,461). Due to fish health concerns and holding pond limitations, some of the Clark Fork River kokanee were moved off site to other holding ponds. Clark Fork Fish Hatchery received 7,717 kokanee and Sandpoint Fish Hatchery received 1,460 kokanee.

The Sullivan Springs trap collected 130,323 fish of which 35,444 were females (27.2%). A total of 9,642 kokanee were passed above the trap to spawn naturally in Sullivan Springs Creek.

Spawntaking

Clark Fork River kokanee spawntaking began on October 26 and continued to January 10, 1994. Spawntaking ran from November 8 to December 30 at the Sullivan Springs fish trap. The 1990 brood year kokanee spawntaking began November 16 and ended January 20, 1994.

A total of 11,233,915 kokanee eggs were collected during the 1993-1994 spawning operation. The Clark Fork River run yielded 1,059,648 green eggs, Sullivan Springs yielded 10,037,495 eggs, and the captive broodstock 136,772 eggs (Appendix C).

EGGS RECEIVED

Deadwood Kokanee

About 2,235,800 green early-running kokanee eggs from Deadwood Reservoir in central Idaho were received in mid-September 1993. As of December 31, 1993, about 1,075,800 early kokanee fry were on hand averaging 0.83 inches. These fish will be used for lowland lake stocking.

Colorado Kokanee

About 942,736 eyed eggs from late-spawning kokanee from Blue Mesa Reservoir, Colorado were received from the Colorado Game and Fish Department's Roaring Judy State Fish Hatchery on December 1, 1993. At the end of 1993, about 922,024 kokanee sac fry were on station. These fish will be used for lowland lake stocking.

Hayspur Rainbow Trout

About 1,494,744 eyed eggs from domestic rainbow trout were received from Hayspur Fish Hatchery during December 1993. These will be transferred as fingerlings to Hagerman Fish Hatchery in late spring of 1994.

PUBLIC RELATIONS

The surrounding communities identify Cabinet Gorge Hatchery as the major contributor of kokanee to the Lake Pend Oreille fishery. The economic importance of this fishery has been estimated at over $5 million. The hatchery has been the focus of many radio, television, and newspaper stories in recent years. This past year's fish loss brought the hatchery national media attention.

About 600 people signed our guest registration book this year. Numerous tours were given to school groups and other organizations. An estimated 2,000 visitors toured the hatchery during 1993.

SPECIAL STUDY

Due to the increasing ratio of males to females in late spawning kokanee salmon, a feed experiment was performed from May 5 to August 9, 1993. Prior to the experiment, it was speculated that the increased ratio of males to females was precipitated by high levels of testosterone in processed diets. The experiment involved feeding three diets to six lots of kokanee broodstock progeny (one diet per two lots). The three diets were our production diet of Rangen's semi-moist starter and Bio-diet feed, a diet of freeze-dried krill, and a diet of brine shrimp.

The feed experiment ended August 9, 1993. Thirty fish from each lot (N-180) were randomly selected for sex gender identification. Each of these selected fish were checked for developing internal sex organs. The brine shrimp groups had the highest percentage of females (43-47%) with the Rangen's and Bio-diet groups having the lowest percentage of females (30-37%). The krill fed groups were intermediate to the other groups in sex ratios (40%).

ACKNOWLEDGEMENTS

Cabinet Gorge Hatchery personnel wish to thank the Lake Pend Oreille Idaho Club for providing spawning volunteers and the $2,600 provided to hire part time spawners. Special thanks to Ned Horner for coordinating regional personnel help and Rob Soumas for coordinating spawning help with IDFG Reservists. Clark Fork Fish Hatchery provided much needed personnel and equipment during 1993 which was essential in our operation of Cabinet Gorge Fish Hatchery.

Appendix A. Production summary, all species, 1992-93.

Species	Number	Pounds	Feed fed	Annual cost	Cost/lb of fish	Cost/1,000 fish	Conversion
Fry							
LPDO KL	621,506	2,213	3,085	130,400	58.92	209.81	1.4
DWD KE	546,627	2,312	3,446	21,000	9.08	38.42	1.7
CO KL	15,332	43	86	6,000	139.53	391.34	10.4
R-9	876,857	5,450	4,887	4,420	0.81	5.04	1.0
Broodstock							
1989 KL	2,806	2,192	50	2,000	0.91	712.76	NA
1990 KL	23,875	11,655	10,956	9,000	0.77	376.96	1.7
1991 KL	37,231	7,293	10,842	6,000	0.82	161.16	2.0
1992 KL	44,399	1,867	2,476	3,600	1.93	81.08	1.5
1990 BU	2,863	1,781	1,039	4,000	2.25	1,397.14	1.1
TOTALS	2,171,496	34,806	36,867	186,420	5.36	85.85	1.6

Appendix B. Summary report of Eagle Fish Health Laboratory results for Cabinet Gorge Hatchery (Class C). January 1 - December 31, 1993.

Brood year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
1992	CG	Kokanee	93-011	-	-											*DX: Environmental toxicity, Stress, CYD GBD(suspect);Viro 0/20
1992	SulvSp	Kokanee	93-042	-	-											DX: Enviro. stress, BGD, Air bladder distention; Viro 0/35
1992	SulvSp	Kokanee	93-055	-	-											DX: Enviro. stress; Viro 0/20
1992	SulvSp	Kokanee	93-076	-	-											DX: Environmental toxicity, Starvation, BGD, Mycosis (gill), Viro 0/40
1992	CG	Kokanee	93-134	-	-											DX: Environmental toxicity, CYD, BGD, Starvation, Mycosis (gill), Viro 0/30
1991	Cold Ck	Bull trout	93-267	-	-		+	-	-	-						DX: RS, Bacteremia; Viro 0/6, ELISA 3/6 (low), FA 0/6, Bacte 3/6 Ps. fluorescens, Aeromonas sp., Shewanella (Ps.) putrefaciens
1991	CG	Kokanee	93-333	-	-		+									IX: RS; ELISA 2/11 (low), FA 1/60, Viro 0/60
1992	SulvSp	Kokanee	93-335	-	-		-									IX: Negative for pathogens; FA 0/60, Viro 0/60
1990	CG	Kokanee	93-338	-	-		+									DX: BKD, Bacteremia; FA 4/5 (3 TNTC, 1 low), Viro 0/5, Bacte 1/4 Aeromonas sp., 1/4 Flexibacter sp.
1991	SulvSp	Kokanee	93-500				+									DX: BKD; FA 9/10 (8 TNTC), ELISA 2/2 (highs)
1992	SulvSp	Kokanee	93-501				+									DX: RS; FA 2/10 (low) ELISA 1/2 (low)

Appendix B. Continued.

Brood year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
Brood	CF Riv.	Kokanee	93-575	-	-		+	-	-	-						IX: BKD, MAS; FA 4/60 (3 mod,1 high), ELISA 3/12 (2 low, 1 mod), Bacte 8/12 (Aeromonas sobria 5/12, Flavobacterium 3/12), Viro 0/60
Brood	CF Riv.	Kokanee	93-576	-	-		+					-				IX: BKD; ELISA 3/4 (1 low, 2 high pools) FA 6/20 (1 light, 4 mod,1 heavy), WHD 0/20, Viro 0/20, Bacte 2/4-Flexibacter sp. (negative to F. psychrophilus antisera)
Brood	SulvSp	Kokanee	93-577	-	-		-	-	-	-		-				IX: Negative for pathogens; Viro 0/60, FA 0/60, WHD 0/20, ELISA 0/60, Bacte NSG

IHN Infectious Hematopoietic Necrosis virus
IPN Infectious Pancreatic Necrosis virus
EIBS Erythrocytic Inclusion Body Syndrome virus
BKD Bacterial Kidney Disease (Renibacterium salmoninarum)
RS Positive for Renibacterium salmoninarum but not clinical disease
FUR Bacterial Furunculosis (Aeromonas salmonicida)
ERM Enteric Redmouth Disease (Yersinia ruckeri)
CWD Coldwater Disease (Flexibacter psychrophilus)
PKD Proliferative Kidney Disease (PKX)
WHD Whirling Disease (Myxosoma cerebralis)
CSH Ceratomyxa shasta
ICH Ichthyophthirius multifilis
GBD Gas Bubble Disease
MAS Motile Aeromonad Septicemia
CYD Coagulated Yolk Disease
BGD Bacterial Gill Disease
NSG Nonsignificant Growth
TNTC Too Numerous To Count

IX Inspection (routine hatchery visit)
DX Diagnostic (sampled because of sick fish)

Appendix C. Lake Pend Oreille kokanee spawning summary, 1993.

Spawning location	Total fish	Females spawned	Green eggs	Percent fecundity	Females
Granite Creek	130,232	31,577	10,037,495	318	26.2
Clark Fork River	49,187	3,013	1,059,648	352	29.4
CGKH broodstock	640	298	136,772	459	NA
TOTALS	180,059	34,888	11,233,915	322	

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

CLARK FORK FISH HATCHERY

1993

Prepared by:

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INTRODUCTION

The Clark Fork Hatchery is a resident species "specialty" station located on Spring Creek 1.5 miles northwest of Clark Fork, Idaho. Approximately 10,000 westslope cutthroat trout broodstock are held on station providing the state's only captive source of westslope cutthroat eggs. In addition to westslope cutthroat, brook, brown, golden, Kamloops, and rainbow trout as well as grayling and kokanee are reared for distribution in the waters of the Panhandle Region. Over 125,000 rainbow trout >9 inches are received each year from production hatcheries in southern Idaho and redistributed from March through October. Originally constructed by the Washington Power Administration (WPA) in 1934 and completed in 1938, the Clark Fork Hatchery is now funded for operation by Idaho Department of Fish and Game (IDFG) license fees. Water diverted from Spring Creek provides for incubation and rearing, with flows of 8-15 cubic feet per second (cfs) at temperatures averaging 41^{o}F in winter and 48^{o}F in summer. A well provides approximately 100 gpm of 45^{o}F water to one bank of incubators. Unused well water can be diverted to fiberglass rearing troughs to mix with Spring Creek water. Rearing units include Heath incubator stacks, concrete and fiberglass early rearing vats, concrete raceways, and earthen broodstock ponds.

FISH PRODUCTION

Trout production at the Clark Fork Hatchery addresses three different objectives: 1) maintenance of a captive westslope cutthroat broodstock of 15,000 adults to spawn at age 4 and 5 years; 2) production of 300,000 6-inch or greater westslope cutthroat for large lake stocking, and (3) rearing westslope cutthroat trout and various other salmonid species to less than 3 inches for release in mountain and lowland lakes (Appendix A). Eggs are collected on station (Appendix B), as well as received from public and private sources.

The broodstock management plan had been altered in an attempt to improve genetic purity. For three years, broodstock from the Clark Fork strain westslope cutthroat, which carry 0.2% rainbow trout genes, have been replaced by genetically pure westslope cutthroat obtained from the Montana State Washoe Park Hatchery broodstock. These fish were reared from eggs at both the Cabinet Gorge and Sandpoint hatcheries prior to arrival at the Clark Fork Hatchery. The average length of the broodstock population observed in 1993 was 11.9 inches (range 9.1-16.0 inches).

Although survival in the Montana strain fish was good when transferred to the Clark Fork Hatchery as fingerlings, survival of fry from Montana strain eggs taken on station was very poor. Resistance to the IPN found in the Spring Creek water supply was not well developed.

During 1993, 168,666 (16,831 lbs) brood year 1991 6-inch plus westslope cutthroat were released. Another 16,000 (2,909 lbs) 8-inch brood year 1991 and 50,000 (2,550 lbs) 5-inch brood year 1992 westslope cutthroat were transferred to net pens on Lake Pend Oreille for rearing to release in 1994. To reduce loading in the fall, 63,330 (3,850 lbs) of brood year 1992 westslope cutthroat were released into lowland lakes. To reduce the total number R9 fingerlings to be reared to catchable size, 61,562 (3,125 lbs) excess 5-inch fingerlings were released in November. Another 5,376 (195 lbs) 4-inch domestic Kamloops left from the mountain lake program were released in December. The fry releases of brood year 1993 fish included 18,000 (248 lbs) Henrys Lake brook trout, 52,513 (18 lbs) westslope cutthroat, 11,492 (62 lbs) domestic Kamloops and 3,250 (2 lbs) grayling. The fry were released in lowland and mountain lakes.

Annual costs to rear and distribute fish from Clark Fork Hatchery are listed in Appendix C.

HATCHERY IMPROVEMENTS

During the spring of 1993, new bird netting was purchased and installed over all outside ponds. Visual observations during the year indicate 100% success in preventing picivorous bird depredation. Additionally, the heavier net and larger mesh size has allowed us to leave the nets in place throughout the winter. Previously, netting had been removed to prevent snow loading problems.

The visitors information area was completed this year. An area map defines the stocking program including species, size, number, and timing of distribution. Extensive use of full color photos and informational narratives completes the center.

A new chemical storage room was constructed during December 1993. This facility relocates formalin storage and handling from the feed mixing room to an isolated area. A fume hood with an oversize exhaust fan removes fumes from the handling area. A water purging line has been installed to back-flush the valves to remove residual formalin. Additionally, a deep sink has been plumbed in to provide clean-up and eye wash capability.

Major construction needs include:

1. A pump and piping to supply pathogen-free water for rearing broodstock, eggs, and fry. One well, with a tested flow of 1,000 gpm, was drilled and capped in 1989.

2. Construction of concrete broodstock ponds to replace the earthen ponds now in use.

3. Construction of additional covered shop/garage space to facilitate vehicle/equipment repair or construction during inclement weather.

FISH HEALTH

Infectious pancreatic necrosis (IPN) and bacterial kidney disease (BKD) continue to be the major fish disease problems at Clark Fork Hatchery. Significant losses to IPN occurred in the brood year 1993 cutthroat trout fry (both Clark Fork and Montana lots). These outbreaks were confirmed by the Eagle Fish Health Laboratory from samples taken on August 12 and on December 2 (Appendix D). However, the outbreak of IPN which usually occurs in brook trout fry about April did not appear in 1993.

Bacterial kidney disease was detected from the Montana cutthroat broodstock by both ELISA and FAT, in the 1991 captive kokanee broodstock by FAT, and in the kokanee broodstock transferred from the Cabinet Gorge Hatchery fish trap by both ELISA and FAT. Signs of chronic BKD were also seen in the production lots of cutthroat trout.

The open water source (Spring Creek) provides a constant reservoir for pathogens. The brook trout in the areas above the hatchery have tested positive for IPN virus (Eagle Fish Health Lab database; Accessions 90-187 and 90-252), but have not been positive for Renibacterium salmoninarum (RS) by FAT (Accessions 89-

097, 90-123, 90-187, and 90-252). Eagle Lab now has the more sensitive ELISA technique available, so these fish should be sampled again in 1994.

If it should prove that the fish in the spring are ELISA low or negative, then the chronic BKD problem might be controllable. There are a number of things that can be tried on the hatchery to reduce the problem. First, the use of erythromycin was effective (following existing INAD protocols) in reducing the BKD outbreak which occurred in the brood year 1991 captive kokanee broodstock during 1993. Similar INAD permits are in place for treating both the cutthroat broodstock and production lots with erythromycin and treatment should prove beneficial. Additionally, pathologists from the Eagle Lab have begun the application process for an INAD permit to test enrofloxacin on the Clark Fork cutthroat broodstock. Enrofloxacin is a bacteriocidal drug which is already approved by the Food and Drug Administration for use against Aeromonas salmonicida in Atlantic salmon. In vitro studies show it to also be effective to inactivate RS. Finally, a more aggressive sampling and culling strategy at spawning, particularly when eggs for future broodstock are taken, would limit the chance of vertical transmission and should help reduce the incidence of active disease in the resulting offspring.

Cleaning up the IPN problem will be more difficult with the existing water source and broodstock population. Isolation incubation and the culling of eggs from positive-tested females could eventually eliminate the virus from the broodstock population, but only if a clean water source is available. Future broodstock would have to remain in clean water, but production fish could go out on creek water after they grow past the most susceptible life state. (Infection could still occur, but the risk of clinical disease and subsequent mortality is much less). Two options for a clean water source are currently available, either make use of the capped well at Clark Fork Hatchery for the incubator building and adult ponds, or transfer the broodstock program to Sandpoint Hatchery and bring fingerling back to Clark Fork for production.

The only other minor disease problem at Clark Fork Hatchery was a parasitism by Gyrodactylus sp. observed in August on the production cutthroat. Numbers of organisms per fish were only moderate, and the problem was alleviated by increasing care in cleaning the raceways and by the dropping autumn water temperatures.

Recommendations for better disease control at Clark Fork Hatchery include:

1. Develop existing well to provide pathogen-free water for incubation and early rearing or make use of facilities at Sandpoint Hatchery for incubation and early rearing.

2. Isolate cutthroat eggs for future broodstock and cull eggs from IPN-positive females. Incubate and rear on pathogen-free water for as long a possible.

3. Sample fish from Spring Creek and test with the ELISA method to confirm the presence of RS above the hatchery.

4. Feed erythromycin to both brood and production cutthroat to minimize the impact of clinical BKD.

5. Re-evaluate production programs with the idea of shifting to more disease-resistant coldwater-tolerant species.

FISH STOCKED AND TRANSFERRED

The Clark Fork Hatchery program distributes fish in the Panhandle Region as directed by IDFG fishery management. The program includes redistributing rainbow trout for put-and-take fisheries; distributing brown, brook, and cutthroat trout fingerlings for put-grow-and-take fisheries; distributing brook, cutthroat, golden, and Kamloops trout fry and grayling to remote sites; and redistributing warmwater and coolwater game fish into the Panhandle Region waters. During 1993, the hatchery staff also took on redistribution for the Cabinet Gorge and Sandpoint hatcheries stocking bull trout, Gerrard strain rainbow trout, and kokanee in the Panhandle, Southwest, and Salmon regions.

Clark Fork Hatchery personnel redistributed approximately 120,185 (52,102 lbs) size 3 (>9 inches) rainbow trout to waters of the Panhandle Region, north of Coeur d'Alene, from March to October 1993. These trout were received from the American Falls Hatchery. Another 5,681 (4,563 lbs) domestic Kamloops trout were stocked to the put-and-take fishery. These trout were reared from egg to release at the Clark Fork Hatchery. Growth time from egg to 9.5 inches was approximately 17 months.

Releases of cutthroat, domestic Kamloops, bull trout, and grayling were delivered to 27 mountain lakes by backpack and helicopter.

During October and November 1993, 16,000 8-inch brood year 1991 and 49,988 5-inch brood year 1992 westslope cutthroat were transferred to net pens in Lake Pend Oreille for rearing to release in May 1994. It is expected that the brood year 1991 fish will provide an instant fishery upon release in 1994. Normally, the net pen-reared fish are less than desirable size to keep at release.

FISH SPAWNING

The Clark Fork Hatchery maintains a captive westslope cutthroat trout broodstock population to provide for needs within the Panhandle Region. Inability to maintain a disease-free population prevents transfer of eggs or fish to other Regions. Presently, approximately 10,000 2- to 4-year-old brood fish are held to spawn in their fourth and fifth year. This provides a potential for taking 2 million green eggs, yielding from 1 to 1.5 million eyed eggs. During past years, the egg requirement has varied substantially. Fish requirements have ranged from over 1 million "button up" fry for nursery stream release, to 150,000 to 350,000 2-year-old, 6-inch fish for release in large lakes. To maintain a broad range of flexibility for fishery management staff, the broodstock population has been held to meet the high-end requirement. Excess fry are released, to comply with Regional preference, when annual population analysis and stocking requirements have been completed.

During the 1993 spawning season (April 28 to June 22, 1993), 953,627 eggs were collected (Appendix B). Average fecundity of 986 females was 967 eggs/female. A saline diluent was utilized during fertilization, and buffered iodophor disinfection solutions were used to water-harden eggs. A 64% eye-up occurred resulting in 607,149 eyed eggs; that was above the expected 50-60% experienced in the past. An implementation of loading density and treatment regimes could be part of the reason for greater success. It was observed that egg size and fecundity was lower in the Montana strain broodstock.

FISH FEED

Normal production feeding utilizes Bioproducts Inc. (Warrenton, Oregon) Biodiet starter and Biodry 4000 diet with ration quantity adjusted to growth on a daily basis. The feed projection program uses Haskell's formula with Delta L adjusted for expected monthly water temperature. Data on Spring Creek daily water temperature has been collected since 1980, and feed tests utilizing a variety of diets, feed delivery techniques, and rearing densities since 1989 have been utilized to institute the current program. Feed utilized and total cost during 1993 is found in Appendix E.

PUBLIC RELATIONS

Public relations efforts in 1992 were similar to those of previous years. There were approximately 3,000 visitors to the station again this year. Hatchery personnel made efforts to talk with as many of them as possible. As always, numerous tours were scheduled and provided to public and private schools, 4-H and FFA groups, as well as families. A visitor information pamphlet was developed by hatchery personnel to complement the visitor information center and has been well accepted by the public.

More time was spent with the Lake Pend Oreille Idaho Club in 1993, as the Clark Fork staff was much more involved in the kokanee rearing and trapping program. Dealings with members of this group shows that positive working relationships continue to benefit the Department image. The Boundary Backpackers, North Idaho Flycasters, and Rocky Mountain Academy were helpful in mountain lake stocking again in 1993. Members of these clubs planted cutthroat fry in 15 mountain lakes for us.

SPECIAL PROJECTS

During the year we have spent many hours on projects away from the hatchery. We have assisted the Panhandle Region personnel with data collection to determine fish populations in several north Idaho lakes. We marked 28,387 catchable rainbow trout with an adipose fin clip for fisheries management investigations.

An experiment to determine early rearing effects on maturation age of kokanee continues. The study is designed to see if rate of growth of fry prior to release effects the age at which kokanee mature. This will be a 4-year study that may effect how kokanee fry are reared before release.

ACKNOWLEDGEMENTS

We would like to thank the U.S. Forest Service for providing air time with a helicopter to stock mountain lakes. We would also like to thank the Boundary Backpackers Club, North Idaho Flycasters, Rocky Mountain Academy, and Panhandle Region personnel for packing fish to mountain lakes. A special thanks to the U.S. Forest Service for planting large bull trout in mountain lakes with the use of helicopter and fire bucket. Without their help the project could not have been accomplished. These groups were of great assistance in completing the mountain lakes stocking program.

Appendix A. Fish production at Clark Fork Hatchery, January 1, 1993 to December 31, 1993.

SPECIES & STRAIN	SOURCE	BEGINNING NUMBERS	BEGINNING POUNDS	ENDING NUMBER	ENDING POUNDS	NUMBER STOCKED	POUNDS STOCKED	DESTINATION
BROOK TROUT BDYR92	HENRY'S LAKE	50,000	EGGS	16,614	706.0	18,000	248.0	MIRROR LAKE
CUTTHROAT C2BDYR88	CLARK FORK	1,071	1,409.0	0	0.0	0	0.0	BROODSTOCK
CUTTHROAT C2BDYR89	MONTANA	1,694	1,377.0	1,240	1,771.0	0	0.0	BROODSTOCK
CUTTHROAT C2BDYR90	MONTANA	4,638	1,616.0	4,015	4,015.0	0	0.0	BROODSTOCK
CUTTHROAT C2BDYR91	CLARK FORK	206,640	11,577.0	4,967	1,307.0	168,666	16,831.0	PANHANDLE REGION
CUTTHROAT C2BDYR92	CLARK FORK	373,179	1,573.0	213,854	12,674.0	113,330	6,400.0	LOWLAND LK/NET PEN
CUTTHROAT C2BDYR92	MONTANA	4,135	12.0	0	0.0	0	0.0	TRANSFER INTO CF LOT
CUTTHROAT C2BDYR93	CLARK FORK	391,341	EGGS	200,527	996.0	6,096	3.0	PANHANDLE REGION
CUTTHROAT C2BDYR93	MONTANA	216,093	EGGS	31,611	62.0	46,417	15.0	MTN LAKES
KAMLOOPS K1BDYR91	GLOYD SPRINGS	6,315	2,746.0	0	0.0	5,681	4,563.0	TO PUT AND TAKE FISHERY
KAMLOOPS K1BDYR93	HAYSPUR	93,984	EGGS	50,000	24.0	16,868	257.0	MTN LAKE
RAINBOW TROUT R9HSP92	HAYSPUR	129,999	31.0	83,476	7,015.0	61,562	3,125.0	LOWLAND KAKES
KOKANEE KLBDYR91	SULLIVAN SPRINGS	4,509	104.0	2,439	411.0	0	0.0	EXPERIMENTAL FISH
TOTALS		1,483,598	20,445.0	608,743	28,981.0	436,620	31,442	

CFTABLS

Appendix B. Spawning summary, Clark Fork westslope cutthroat, January 1, 1993 to December 31, 1993.

STOCK	FEMALES SPAWNED	NO. EGGS COLLECTED	AVERAGE FECUNDITY	PERCENT EYE-UP	EYED EGGS
CLARK FORK	564	621,176	1,101	63	391,341
MONTANA	422	332,451	788	65	215,808
TOTALS	2,835	953,627	593	64	607,149

Appendix C. Cost of fish produced at the Clark Fork Hatchery January 1, 1993 to December 31, 1993.

SPECIES	ACTUAL PRODUCTION	WEIGHT* POUNDS	COST TO PRODUCE AND STOCK	COST PER 1,000 FISH	COST PER INCH
(BK)HENRY'S LAKE BROOK TROUT 3-5"	34,614	954	$5,000	$144.45	$0.036
(C2)CUTTHROAT BDYR91 >6"	178,888	9,354	$25,000	$139.75	$0.021
(C2)CUTTHROAT BDYR92 2-5"	327,184	17,501	$20,000	$61.13	$0.012
(C2)CUTTHROAT BDYR93 1"	232,138	1,000	$10,000	$38.77	$0.039
(R9)RAINBOW R9HSP92	145,038	10,109	$3,000	$20.68	$0.0032
(KL)KOKANEE	2,439	307	$1,000	$410.00	$0.051
(K1)KAMLOOPS	71,906	2,098	$4,000	$55.62	$0.023

* Weight includes both stocked weight and increase in weight for 1993.

CFTABLS

Appendix D. Summary report of Eagle Fish Health Laboratory results for Clark Fork Hatchery (Class C), January 1 - December 31, 1993.

Brood year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
1989	Mont-WS	Cutthroat	93-221	-	-		+					-				DX: BKD, Mycosis (external,); ELISA 4/6 (4 high), FA 7/30 (5 TNTC), Viro 0/60, WHD 0/30
1987	CF-WS	Cutthroat	93-225	-	-											DX: Negative for pathogens; Viro 0/19
1993	CF-WS	Cutthroat	93-330	-	+			-	-	-						DX: IPN, BS; IPN 9/12 Ps. fluorescens 2/12, Flavobacterium 2/12
1991	SulvSp	Kokanee	93-343				+									DX: BKD; FA 20/20 (17 TNTC)
1993	CF-WS	Cutthroat	93-574	-	+											DX: IPN, BS; IPNV 3/3 pools, Pseudomonas sp. 4/4, Staphlococcus 2/4

IHN Infectious Hematopoietic Necrosis virus
IPN Infectious Pancreatic Necrosis virus
EIBS Erythrocytic Inclusion Body Syndrome virus
BKD Bacterial Kidney Disease (Renibacterium salmoninarum)
RS Positive for Renibacterium salmoninarum but not clinical disease
FUR Bacterial Furunculosis (Aeromonas salmonicida)
ERM Enteric Redmouth Disease (Yersinia ruckeri)
CWD Coldwater Disease (Flexibacter psychrophilus)
PKD Proliferative Kidney Disease (PKX)
WHD Whirling Disease (Myxosoma cerebralis)
CSH Ceratomyxa shasta
ICH Ichthyophthirius multifilis
GBD Gas Bubble Disease
MAS Motile Aeromonad Septicemia
BS Bacterial Septicemia (Pseudomonas fluorescens)

TNTC Too Numerous to Count

IX Inspection (routine hatchery visit)
DX Diagnostic (sampled because of sick fish)

Appendix E. Fish feed used in 1993 at the Clark Fork Hatchery.

SIZE	SOURCE	POUNDS	COST/POUND	TOTAL COST
BIODIET STARTER #1	BIOPRODUCTS	196.8	.86	169.25
BIODIET STARTER #2	BIOPRODUCTS	530.0	.86	457.35
BIODIET STARTER #3	BIOPRODUCTS	949.0	.86	816.31
BIODIET 1.0 MM	BIOPRODUCTS	1,204.5	.54	645.40
BIODIET 1.3 MM	BIOPRODUCTS	1,343.7	.52	698.72
BIODIET 1.5 MM	BIOPRODUCTS	1,076.5	.53	573.20
BIODIET 3.0 MM	BIOPRODUCTS	1,756.2	.64	1,124.49
BIODRY 4000 1.0 MM	BIOPRODUCTS	1,604.0	.57	834.39
BIODRY 4000 1.3 MM	BIOPRODUCTS	250.2	.57	142.62
BIODRY 4000 1.5 MM	BIOPRODUCTS	8,221.5	.52	4,275.18
BIODRY 4000 2.5 MM	BIOPRODUCTS	18,262.5	.46	8,400.75
BIODRY 4000 3.0 MM	BIOPRODUCTS	9,512.0	.46	4,375.53
BIODRY 4000 4.0 MM	BIOPRODUCTS	8,343.9	.46	3,854.41
BIODIET BROOD 5.0 MM	BIOPRODUCTS	2,363.2	.53	1,240.24
BIODIET BROOD 6.0 MM	BIOPRODUCTS	1,495.1	.55	819.80
MOORE CLARK SEMI-DRY 3.2 MM	MOORE CLARK	3,201.2	.33	1,056.40
RANGEN GROWER 1/8	RANGEN	2,314.6	.25	585.59
RANGEN GROWER 3/16	RANGEN	3,034.2	.25	767.65
TOTALS		65,659.1		30,837.28

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

CLEARWATER FISH HATCHERY

1993

Prepared by:

Brad George, Fish Hatchery Superintendent I

INTRODUCTION

Clearwater Fish Hatchery is located on the north bank of the North Fork of the Clearwater River at the confluence of the North Fork and the mainstem of the Clearwater River in Clearwater County, Idaho. The hatchery was built by the Corps of Engineers under the Lower Snake River Compensation Plan (LSRCP) and was completed in 1992. The hatchery is funded through the U.S. Fish and Wildlife Service, who will also own the facility when all construction is complete. The hatchery is operated by the Idaho Department of Fish and Game (IDFG).

The primary purpose for Clearwater Hatchery is to rear and release steelhead trout and chinook salmon as mitigation for the Lower Snake River dams. However, full production of anadromous fishes will not be achieved every year, leaving facilities available for rearing resident rainbow trout on a year to year basis. The first year's production will be funded through LSRCP as experimental fish to test out the new facilities at the hatchery. Subsequent rainbow production will be funded by IDFG.

The hatchery water source is a double pipeline from Dworshak Dam, which can supply over 60 cfs of reservoir water to the facility. There are two intakes at the dam. The primary intake is adjustable to take water from the reservoir surface (5 feet to 40+ feet depth). The secondary intake is at a fixed depth (200+ feet below full level). This design allows blending waters of different temperatures during the portion of the year when the reservoir is stratified.

FISH PRODUCTION

The first fish ever reared at Clearwater Hatchery were the 1991 lot of Mt. Lassen rainbow trout. A total of 249,503 Mt. Lassen rainbow trout (Appendix A) weighing 108,811 pounds (average 2.1 fish per pound) and ranging from 9 to 16 inches in length were stocked in the Clearwater Region waters during 1993. This lot of fish gained 70,411 pounds during 1993 and consumed 89,097 pounds of fish food for a food to fish conversion rate of 1.27:1.

The second lot of rainbow raised at Clearwater Hatchery were the 1992 and 1993 lot of Kamloop rainbow trout supplied by Black Canyon Trout Farm, Grace, Idaho. These fish will be raised to catchable size for stocking during 1994. As of December 31, there were 195,802 Kamloop trout on hand (Appendix A) weighing a total of 38,400 pounds. This lot of fish consumed 43,067 pounds of fish food for a food to fish conversion rate of 1.12:1.

Production costs were down significantly over last years (Appendix B) due primarily to increases in production of chinook salmon and steelhead trout.

No rainbow eggs were received due to space limitations in incubation and early rearing.

FISH HEALTH

The brood year 1991 Mt. Lassen rainbow trout were sampled in January and February prior to the spring stocking in Clearwater Region waters (Appendix C). They were found negative for pathogens. Hatchery personnel observed a minor parasitism by Gyrodactylus sp. in April, but no treatment was prescribed. This lot of fish did not do particularly well at Clearwater Hatchery during their early rearing period in 1992. Repeated jumps in mortality were generally attributed to infections of Pseudomonas sp. (often oxytetracycline-resistant). Mortality rates in 1993 generally remained higher than should be expected, likely

as carry-over from the earlier problems. These were the first fish ever reared at Clearwater Hatchery and experienced many of the difficulties associated with new, untested facilities and equipment.

The brood year 1992 Black Canyon rainbow trout experienced high losses of eggs and fry which may be attributed to the poor quality of the eggs when they were received at Clearwater. Losses were not unusually alarming once the fish were on feed and growing. An inspection sample was taken in September, and Eagle Fish Health Laboratory personnel detected a nonsignificant amount of bacterial growth, identified as Pseudomonas sp. No other pathogens were detected. Another full inspection will be done in early 1994, prior to stocking.

As long as resident fish production continues at Clearwater, the recommendation would be to continue isolation of rainbows from anadromous fish on station.

FISH STOCKED AND TRANSFERRED

Clearwater Hatchery personnel stocked a total of 249,503 Mt. Lassen strain catchable rainbow trout in streams and lakes of Region 2 during 1993. These fish averaged 2.1 fish per pound for a total weight of 118,811 pounds, and averaged approximately 10.6 inches in length. The stocking request for Clearwater Hatchery was 239,500 fish. Our program met 104% of this request.

It was a good water year in Region 2, so we had few difficulties making 110 fish plants at 28 different lakes and streams. During August, we did not have enough personnel to get all the fish plants out on time, so some of the fish plants were moved to September after discussing the problem with regional fisheries personnel.

FISH FEED

A total of 132,164 pounds of fish feed was purchased during 1993 for the resident fish program at Clearwater Hatchery (Appendix D). All feed came from contract sources Rangen Inc. and Bio-Products. The overall conversion was 1.19 pounds of feed to produce one pound of fish.

PUBLIC RELATIONS

Clearwater Hatchery had over 2,800 visitors during 1993. This included two school tours from Orofino and Cottonwood. Tours were also given to the Governor's Committee on water quality, U.S. Department of Agriculture and Forest Service personnel, Grizzly Bear Recovery team and a college class from Prince Edward Sound, British Columbia, Canada.

Hatchery personnel gave presentations to the Kelly Creek Fly Castors, the Orofino Kiwanis Club, and Potlatch Corporation. Personnel also assisted in teaching Hunter Education classes in Orofino.

ACKNOWLEDGEMENTS

The Clearwater Hatchery crew is large and are assigned a wide diversity of responsibilities. The group primarily responsible for the resident program included Brad George (Superintendent I); Dan Baker, Kent Bourbon, CalLee Davenport, and Bob Turik (Fish Culturists); Ric Downing (Fisheries Tech); Dave Robertson, Yolanda Inguanzo, Brian Spence, John Walz and LeeRoy Jones (Bio-Aides); and Holly Zipse (JTPA).

Special acknowledgement goes to Ernie Yost (Utility Craftsman) who was very important in getting the physical and mechanical aspects of the fish hatchery to function, Jerry McGehee (Superintendent III) who provided the leadership and logistic support that made this operation a success, and Renee' Hedrick for typing the report and helping with editing.

Appendix A. Numbers of eggs and fish received and distributed by Clearwater Hatchery in 1993

Species/ strain	Egg source	Eggs received	Fish on hand	Planted	Destination
Rainbow/R4	Mt. Lassen Trout Farm	0*	0	249,503	Region 2
Rainbow/K3	Black Canyon Trout Farm	246,627**	195,802	0	Region 2

*Eggs received in 1991.
** Eggs received in 1992.

Appendix B. Costs of resident fish production at Clearwater Fish Hatchery, January 1 through December 31, 1993.

Species/ strain	Pounds produced	Number produced	Size (in)	Production costs	Cost per lb	Cost per fish
Rainbow/R4	70,411	249,503	10.6	$50,065	$0.71	$0.20
Rainbow/K3	38,400	195,802	7.9	$21,280	$0.55	$0.11

Appendix C. Summary report of Eagle Fish Health Laboratory results for Clearwater Hatchery--Resident Program (Class C), January 1 - December 31, 1993.

Brood year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
1991	Mt. Lassen	Rainbow	93-005										-			IX: Negative for pathogens; WHD 0/23
1991	Mt. Lassen	Rainbow	93-046	-	-		-	-	-	-						IX: Negative for pathogens; Viro 0/10, Bacte 0/10 (NSG)
1992	Blk Canyon	Rainbow	93-460	-	-		-	-	-	-						IX: Negative for pathogens; Bacte 0/8, Viro 0/10

IHN Infectious Hematopoietic Necrosis virus
IPN Infectious Pancreatic Necrosis virus
EIBS Erythrocytic Inclusion Body Syndrome virus
BKD Bacterial Kidney Disease (Renibacterium salmoninarum)
RS Positive for Renibacterium salmoninarum but not clinical disease
FUR Bacterial Furunculosis (Aeromonas salmonicida)
ERM Enteric Redmouth Disease (Yersinia ruckeri)
CWD Coldwater Disease (Flexibacter psychrophilus)
PKD Proliferative Kidney Disease (PKX)
WHD Whirling Disease (Myxosoma cerebralis)
CSH Ceratomyxa shasta
ICH Ichthyophthirius multifilis
GBD Gas Bubble Disease
MAS Motile Aeromonad Septicemia
NSG Nonsignificant Growth

IX Inspection (routine hatchery visit)
DX Diagnostic (sampled because of sick fish)

CLRAPP

Appendix D. Fish feed usage and costs for the Clearwater Hatchery rainbow trout program, January 1 through December 31, 1993.

Lot	Source	Formulation	Size	Pounds	Cost per lb	Total cost
91-C-R4	Rangen	Grower & TM 100	5/32 in	9,970	0.405	$4,037.85
	Rangen	Grower	5/32 in	79,127	0.2382	$18,848.05
Total				89,097		$22,885.90
92-ID-K3	Bioproducts	Biodiet	#1	78		$67.23
	Bioproducts	Biodiet	#2	312		$268.91
	Bioproducts	Biodiet	#3	230		$198.24
	Bioproducts	Biodiet	1.0 mm	378		$265.70
	Bioproducts	Biodiet	1.3 mm	346		$225.56
	Bioproducts	Biodiet	1.5 mm	3,019		$1,985.29
	Bioproducts	Biodiet	2.5 mm	1,550		$948.91
	Rangen	Trout Grower	3/32 in	5,239		$1,467.97
	Rangen	Trout Grower Bulk	1/8 in	31,918		$7,602.87
Total				43,067		$13,030.68

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

GRACE FISH HATCHERY

1993

Prepared by:

Robert Hill, Fish Hatchery Superintendent II
Kurtis Schilling, Fish Hatchery Superintendent I
Ron Reardon, Fish Culturist

INTRODUCTION

Grace Fish Hatchery is owned and operated by the Idaho Department of Fish and Game (IDFG) and is funded by license sales. The hatchery was constructed in 1946 and is located 7 miles south of Grace, Idaho, and 2 miles east of Highway 34 in Caribou County.

The objective of the hatchery is to produce catchable and fingerling rainbow trout Onchorhynchus mykiss for stocking, primarily in Southeast Regional waters. The hatchery also produces various other species of trout to meet statewide requests.

Middle and West Whiskey Creek Springs are the two water sources for the hatchery. Historical water flow is from 6.9 to 24 cfs with a year-round temperature of 52^{o}F. A seven-year drought has lowered the water volume in the aquifer above the hatchery, and as a result, water flows for the past five years have been approximately half the average flow from 1983 to 1987. In 1993, flows ranged from a record low of 6.9 cfs to a high of 12.3 cfs. It is believed that flow from the spring is dependent upon precipitation received 18 months earlier. Average peak flow occurs in September and minimum flows are experienced in May.

Fish rearing space consists of 16 (3 ft x 1.5 ft x 13 ft) single-pass hatchery building vats, 16 (4 ft x 3.5 ft x 40 ft) single-pass small raceways, 4 (4 ft x 3.5 ft x 100 ft) single-pass medium raceways, and 6 (14 ft x 2 ft x 300 ft) large raceways. The water for the large raceways is second use water from the vats, small, and medium raceways that is mixed with fresh water from the middle spring. All hatchery water flows through a settling pond before being discharged into Whiskey Creek.

Grace Hatchery is staffed with a Fish Hatchery Superintendent II, a Hatchery Superintendent I, and a Fish Culturist. Up to three temporary employees may be hired to assist with the various projects.

Grace Hatchery is responsible for the operation of two fish traps from about April 1 to June 1 each year. One trap is on St. Charles Creek, a tributary to Bear Lake. Bonneville cutthroat trout Onchorhynchus clarki utah, commonly known as Bear Lake cutthroat, are trapped, measured, sexed, checked for marks that indicate hatchery origin, then released above the trap at several locations so they can spawn naturally. The second trap is on the Blackfoot River, a tributary to Blackfoot Reservoir, near China Hat. The Yellowstone cutthroat trout Onchorhynchus clarki bouvieri is the species of concern at this trap.

FISH PRODUCTION

Grace Hatchery began the 1993 calendar year with 755,669 fish at a weight of 44,109 pounds. During 1993, 1,568,899 eggs of various species were received. A total of 1,397,228 (106,434 lbs) fish were either stocked or transferred from the hatchery. At the end of the year there were 509,554 (31,064 lbs) fish and 454,661 eggs on the facility (Appendix A). This results in a total production of 1,434,138 fish and 86,163 pounds for the 1993 calendar year (Appendix B).

In 1993, five species of trout were reared at Grace Hatchery. The Hayspur strain of rainbow trout accounted for the largest portion of production. These fish were produced to catchables mainly for Southeast Regional waters and to fall fingerlings for seven study reservoirs in the Southeast Region. This is part of a put-and-grow trout evaluation study, which is analyzing the return-to-the-creel of spring catchables verses fall fingerlings. The spring catchables are maxillary-clipped and fall fingerlings do not receive any mark (Appendix C). Fish production for this study will conclude with the 1994 fall fingerling plant.

Two brood years of Bonneville cutthroat were also reared at Grace this year. Brood year 1992 fish were all adipose-clipped and stocked as fingerlings into Blackfoot Reservoir (Appendix C). These fish were progeny of the spawntaking at the Blackfoot River trap in 1992. Brood year 1993 fish were received as eyed eggs from Egan Hatchery in Utah. Some of these fish were stocked as unfed fry into Montpelier Creek above Montpelier reservoir. Most of the remainder have been adipose-clipped and will be stocked into Blackfoot Reservoir the spring of 1994 to provide a cutthroat fishery; unmarked cutthroat are prohibited from being harvested from Blackfoot Reservoir (Appendix C). The others will be stocked as catchables elsewhere in Southeast Regional waters in 1994.

There were basically three groups of brown trout Oncorhynchus trutta reared at Grace Hatchery. The first group was received as eyed eggs from Manchester Hatchery in Iowa. These were stocked as fingerlings in Southeast Regional waters and a portion were transferred to Nampa Hatchery. The second group was received from Ashton Hatchery, and all were stocked out as fingerlings in the Southeast Region. The third group were eyed eggs received in November and will be stocked as fingerlings in the Southeast Region in 1994.

In 1993, two brood years of splake were handled at the hatchery. These specialty fish are a hybrid of a lake trout and a brook trout. The 1992 brood year fish were held over to hopefully produce a larger and more efficient predator before being stocked into Upper Payette Lake. The 1993 brood year fish were all stocked as fingerlings statewide.

The remainder of our production consisted of rearing Henrys Lake cutthroat x rainbow hybrids. These fish will be stocked as catchables in Southeast Regional waters in 1994 to diversify angling opportunity.

The number of fish requested from Grace Hatchery was nearly met on some groups and exceeded on others. The 1993 Bear Lake cutthroat were not requested but produced as extra fish, and some are still on station (Appendix D).

Total production cost for 1993 was derived by adding 50% of 1993 and 1994 budgets minus capital outlay and feed cost. This amount was then divided by 12 to represent each months cost. This monthly cost was then multiplied by the numeric percentage that each lot represented to total hatchery population for the months each lot was present. Each lots' individual feed costs were then added to give total production cost by lot (Appendix B).

HATCHERY IMPROVEMENTS

The major construction project for 1993 was performed by IDFG engineering and construction crews. It consisted of replacing the open water supply creek with a buried perforated pipeline. This pipeline goes from the headrace of the medium raceways up to our property line just downstream of the main spring pond. The downstream end of the pipeline was to empty into a concrete collection basin adjacent to the medium raceways and form the head end of the large raceway headrace. The construction crew did not complete this concrete collection basin due to being called off to another project.

The IDFG construction crew also installed air bleeder valves on the two water supply headers in the hatchery building. This was done to protect against surge damage that has occurred here in the past due to air being sucked down the line because of the low water level in the hatchery building supply pond. They also installed a fish transfer line from the small raceways to medium #1 so it can be used as a common collection site.

A local excavator performed the following projects:

- The domestic water supply to residence #2 was replaced.
- A trough was dug and drain tiles were installed around the rear of residence #2 to prevent the basement flooding problem.
- Drain tiles were also installed underneath the two roadways between the three sets of large raceways.
- Residence #1 had a new metal roof installed over the existing roof. Most of the interior of the same residence was painted.

Needed projects include:

- Burying or covering the spring pond.
- Completion of the collection area adjacent to the medium raceways.
- Cover all the head and tail ditch areas.
- Replace the large raceway headrace with a pipeline and controlling inlet valves to the raceway.
- Install an auxiliary water supply pipe from the main line to the small raceway header.
- Install a cleaning line on the medium raceways similar to that on the small raceways.
- Replace residence #1 and #3 domestic water lines.
- Paint all buildings.
- Install an air bubble cleaning system for at least the large raceways.
- Install baffles on the small and medium raceways.
- Install culverts and grade the driveway.

FISH HEALTH

Fish health was generally very good at Grace Hatchery in 1993. Clinical disease was limited to a "peeled-back" syndrome in the splake which the resident pathologist diagnosed as sunburn followed by a secondary bacteremia (Aeromonas and Pseudomonas species). Coldwater disease was only evident as chronic tail-rot with insignificant losses in the large raceways. No chemical therapies were administered to any fish on the hatchery during the entire year.

Pathologists and technicians at the Eagle Fish Health Laboratory performed a diagnostic analysis on the splake, as well as doing routine inspection work on two lots of rainbow trout and on walleye fry which were direct-stocked by Grace personnel from Blind Pony Hatchery, Missouri (Appendix A). The only reportable pathogen found at Grace Hatchery was Renibacterium salmoninarum (RS), detected only by ELISA at low to moderate levels. No organisms were detected by FAT, nor was there any sign of clinical disease. This is a point of concern in that, prior to 1993, bacterial kidney disease (BKD) had only been detected at ELISA low levels. The organism may have been transmitted vertically to the rainbow trout eggs at Hayspur Hatchery, where an intensive sampling and culling strategy has been initiated to reduce that possibility. However, there is also the possibility of horizontal transmission at Grace Hatchery because there are fish living in the spring and head boxes, and because the hatchery receives potentially RS positive eggs from other sources.

Grace Hatchery is currently classified as a Class B "Isolation" facility due to the open spring. The Department needs to continue efforts to either purchase the spring property or acquire a long-term lease with a provision allowing enclosure of the spring. Grace Hatchery would then have the potential to be upgraded to Quarantine (Class A) status. The primary benefit from this change, aside from better fish health and survivability, would be greater leeway in transferring Grace Hatchery fish (Appendix E).

Recommendations for the 1994 season include:

1. Remove fish from the springs, pipes, and head boxes.

2. Renew negotiations with the landowner to purchase, lease, or Renovate Upper Whiskey Springs.

3. Monitor levels of BKD with the assistance of Eagle Laboratory pathologists and technicians.

FISH STOCKED AND TRANSFERRED

Grace Hatchery moved 1,397,427 fish out in 1993. Of these, 1,313,973 were stocked and 83,454 brown trout fry were transferred out to Nampa Hatchery.

Of the 83,450 fish transferred in, 65,348 were stocked out. Heavy mortality in the brown trout fry transferred in from Ashton Hatchery accounts for the large discrepancy. American Falls Hatchery transferred in 9,500 catchable rainbow to make up for a shortage in our production (Appendix F).

Of the total fish planted, 400,935 were direct plants from other sources. Blind Pony Hatchery in Missouri flew in 400,000 Walleye swim-up fry to Salt Lake City, for Oneida Reservoir. Alexander and Glendale Reservoirs received 460 White Crappie that were captured from Brownlee Reservoir. Ennis National Hatchery in Montana donated 475 excess broodstock that the hatchery crew transported to Montpelier Reservoir.

This leaves a balance of 847,690 of the fish stocked that were actually produced at Grace Hatchery in 1993. Good water conditions in all receiving waters allowed for a normal fish stocking season in 1993.

FISH SPAWNING

The Blackfoot trap was installed and all Bonneville cutthroat trout and 5% of the Yellowstone cutthroat trout were scheduled to be spawned. Extremely high water flows and debris submerged the floating weir so very few fish were trapped and none were spawned. As in past years, there was not any spawn taken at St. Charles Creek trap.

FISH FEED

Two brands and three different diets of fish feed were fed in 1993. A total of 113,200 pounds of feed at a cost of $36,475.58 were fed to produce a total of 86,163 pounds of fish for an overall conversion of 1.3 (Appendix G). There were not any feed experiments performed.

PUBLIC RELATIONS

The only hatchery tour given this year was to 120 grade school students from Montpelier in May. Numerous smaller tours were given throughout the year to the general public.

Hatchery staff assisted with the Free Fishing Day clinic at Kelly Park pond in Soda Springs.

SPECIAL PROJECTS

St. Charles Creek Trap

The St. Charles Creek trap was operated from April 23 through June 29 with 41 males and 41 females trapped. These fish were all released above the weir with most being transported to several locations upstream. As in prior years, no fish were kept for artificial spawning purposes.

Water flow was sufficient throughout the trapping season. Approximately one-third of the canal that was dug in 1992 needed to be dredged again this season.

The trap design and location causes a problem with water flow through the trap. Water flowing out of the culvert upstream of the trap deposits cobble and silt in front of the trap and diverts flow through the weir rather than the trap. Boards and sandbags were placed in the stream to divert water back through the trap.

Blackfoot River Trap

The Blackfoot River trap was operated from April 4 to May 31. Trap numbers were: Yellowstone cutthroat, 24 males, 29 females; Bear Lake Cutthroat, 1, sex not identified; rainbow, 2 males, 1 female; hybrids, 2, sex not identified; suckers, not tallied.

Typically only 5% of the returning females are retained for artificial spawning, and the resulting progeny are released as unfed fry into the upper reaches of the Blackfoot River system. The remaining 95% are released upstream to spawn naturally. In conjunction with spawning, the hatchery crew removes rainbow trout, Bonneville cutthroat, and suckers from the trap. A commercial fisherman hauls the suckers back east for human consumption.

Due to high runoff, the trap was flooded from May 5 until May 26. Extreme effort was required to get the weir back in operation. The holding box was also damaged during the high flow allowing the Yellowstone cutthroat to escape. This trap and weir structure is set on a corner with the actual trap area on the inside of the corner. This allowed for 1 to 2 feet of silt to be deposited in the trap and holding ponds. Fish also have a hard time finding the entrance to the trap.

Other

Ron Reardon has been collecting data from fish in the study reservoirs in the Southeast Region for his Masters degree and the put-and-grow trout evaluation study. Fin and fat indices were taken on the fish prior to release to the study reservoirs (Appendix H).

ACKNOWLEDGEMENTS

Ron Reardon was the only permanent employee to work at the hatchery the entire year. Todd Garlie moved to American Falls Hatchery and was replaced by Kurtis Schilling. Arnie Miller retired from the department for a life in the priesthood, and was replaced by Robert Hill. We would like to thank Doug Burton, Fish Pathologist, for completing the fish health section of this report.

Appendix A. Fish received, stocked, and transferred at Grace Hatchery, 1993.

SPECIES/ STRAIN	EGGS AND FISH REC'D SOURCE	BEGINNING NUMBERS (POUNDS)	PLANTED/ TRANSFERRED # (POUNDS)	ENDING NUMBERS (POUNDS)	DESTINATION
Rainbow Hayspur R9	* 9,500 (5,430) Am Falls	208,202 (42,678)	197,845 (66,670)	0	SE Region Catchables
Rainbow Hayspur R9	466,932 Hayspur	323,773 (174)	439,969 (27,265)	131,168 (21,483)	SE Region Fingerlings & Catchables
Rainbow Hayspur R9	413,661 Hayspur	0	0	413,661 (Eggs)	SE Region Fingerlings & Catchables
Rainbow Kamloops K1	41,260 Hayspur	0	0	41,000 (Eggs)	SE Region Catchables
Splake	Wyoming	5,010 (1,088)	5,123 (3,100)	0	Statewide
Splake	Wyoming	47,700 (20)	36,418 (4,802)	0	Statewide
Browns	Manchester, IO	167,226 (93)	***142,590 (803)	0	SE Region Transfer to Nampa
Browns	** 73,950 (43.5) Ashton		56,644 (1,521)	0	SE Region
Browns	63,899 Saratoga, WY	0		63,004 (29)	SE Region
Cutthroat Bear Lake	Blackfoot Riv.	3,758 (56)	4,892 (425)	0	Blackfoot Res. Adipose clipped
Cutthroat Bear Lake	529,293 Egan, UT	0.0	113,011 (27)	266,129 (7,910)	SE Region Blackfoot AD Clip
Rbt X Cutt Hybrid	53,864 Henry's Lake	0.0	0	49,253 (1,642)	SE Region catchables
Crappie	Brownlee Res	0.0	460 (230)		Alexander Res. Glendale Res.
Walleye	Blind Pony MO	0.0	400,000 (6)		Oneida Res.
Rainbow R1	Ennis, MT	0.0	475 (1,585)		Montpelier Res. & Pond
TOTALS	1,652,359	755,669 (44,109)	1,397,427 (106,434)	964,215 (31,064)	

* Transferred in from American Falls.
** Transferred in from Ashton.
*** 83,454 (203) Transferred to Nampa

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GRACTABS

Appendix B. Number and pounds of fish produced and cost.

SPECIES	SIZE (INCHES)	NUMBER PRODUCED	POUNDS PRODUCED	PRODUCTION COST	COST/ FISH	COST/ POUND
Bear Lake Cutthroat	* 3	379,139	7,783	44,339	0.177	5.69
Browns	3	142,590	710	6,268	0.045	8.77
Browns	3 + 6	56,644	1,589	5,101	0.090	3.21
Bear Lake Cutthroat	6	4,892	369	461	0.094	1.25
Splake	7	36,418	4,782	7,288	0.200	1.52
Rainbow	3 + 5	165,077	3,204	9,819	0.060	3.06
Rainbow	6	274,693	24,061	40,703	0.148	1.69
Rainbow	* 7	131,168	21,483	30,895	0.236	1.44
H.L. Hybrids	* 5	49,253	1,630	7,007	0.142	4.30
Splake	11	5,123	2,012	2,106	0.411	1.05
Rainbow	10	189,141	18,540	19,863	0.105	1.07
TOTALS		1,434,138	86,163	173,850	0.121	2.02

* Size at 12-31-93; production not complete.

Appendix C. Fin clips at Grace Hatchery, 1993.

SPECIES	CLIP/ MARK	NUMBER	DESTINATION
Cutthroat	Adipose	234,171	Blackfoot Reservoir
Rainbow	Right Maxillary	84,750	*Study Reservoirs
Cutthroat	Adipose	4,370	Blackfoot Reservoir
TOTAL		323,291	

* Includes: Chesterfield, Treasureton, Twin Lakes, 24-Mile, Winder, Daniels, and Springfield.

Appendix D. Fish requested and produced at Grace Hatchery, 1993.

Species	Number Requested	Number Produced	% Achieved
Catchable Rainbow	204,350	197,845	97%
Fingerling Rainbow	445,789	439,969	98%
Fingerling Bear L. Cutt.	5,000	4,892	98%
Splake	35,000	7" 36,414 11" 5,123	118%
Browns	86,000	199,234	231%
Walleye	400,000	400,000	100%
Bear L. Cutt. Fry	0	113,011	N/A
White Crappie	0	430	N/A
Ennis XS RBT Brood	0	425	N/A
TOTALS	1,176,139	1,397,343	119%

GRACTABS

Appendix E. Summary report of Eagle Fish Health Laboratory results for Grace Hatchery (Class B), January 1 - December 31, 1993.

Brood year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
1993	Osage R.	Walleye	93-157	-	-											IX: Negative for pathogens; Viro 0/15
1993	Wyoming	Splake	93-290	-	-		+	-	-	-						DX: Enviro. trauma (sunburn), RS, Bacteremia; Viro 0/10, FA 0/10, ELISA 5/10 (low), Aeromonas hydrophila 3/12, Pseudomonas sp. 1/12
1993	Hayspur	Rainbow	93-291	-	-		+	-	-	-		-				IX: RS; Viro 0/60, FA 0/60, ELISA 2/12 pools, Bacte NSG, WHD 0/60
1993	Hayspur	Rainbow	93-445	-	-		+					-				IX: RS; Viro 0/60 FA 0/60, ELISA 5/12 pools (3 low, 2 mod), WHD 0/20

IHN Infectious Hematopoietic Necrosis virus
IPN Infectious Pancreatic Necrosis virus
EIBS Erythrocytic Inclusion Body Syndrome virus
BKD Bacterial Kidney Disease (Renibacterium salmoninarum)
RS Positive for Renibacterium salmoninarum but not clinical disease
FUR Bacterial Furunculosis (Aeromonas salmonicida)
ERM Enteric Redmouth Disease (Yersinia ruckeri)
CWD Coldwater Disease (Flexibacter psychrophilus)
PKD Proliferative Kidney Disease (PKX)
WHD Whirling Disease (Myxosoma cerebralis)
CSH Ceratomyxa shasta
ICH Ichthyophthirius multifilis
GBD Gas Bubble Disease
MAS Motile Aeromonad Septicemia
NSG Nonsignificant Growth

IX Inspection (routine hatchery visit)

Appendix F. Fish transferred to and from Grace Hatchery, 1993.

Species	Number (Pounds)	Transferred From	Transferred To
Catchable Rainbow	9,500 (5,430)	American Falls	
Browns	73,950 (43.5)	Ashton	
Browns	83,454 (202)		Nampa

Appendix G. Fish feed used and cost, Grace Hatchery, 1993.

MANUFACTURER	DIET	SIZE	COST/POUND	POUNDS FED	COST
Bioproducts	Bio-Diet	# 1	1.16	44	51.04
Bioproducts	Bio-Diet	# 2	1.16	92	106.72
Bioproducts	Bio-Diet	# 3	1.16	422	489.52
SUBTOTAL	BIO-DIET			558	647.28
Rangens	Dry	Starter	0.4440	159	70.6
Rangens	Dry	# 1	0.4440	600	266.4
Rangens	Dry	# 2	0.4440	1,700	754.80
Rangens	Dry	# 3	0.4440	6,250	2,775.00
Rangens	Dry	# 4	0.2978	10,400	3,097.12
Rangens	Dry	Coarse Crumble	0.2978	2,000	595.60
Rangens	Dry	1/8 Sack	0.2432	2,000	486.40
Rangens	Dry	1/8 Bulk	0.238	27,040	6,435.52
Rangens	Dry	5/32 Bulk	0.238	44,854	10,675.25
SUBTOTAL	DRY			95,003	25,156.69
Rangens	Soft Moist	Starter	0.7402	240	177.65
Rangens	Soft Moist	1/32	0.6804	516	351.09
Rangens	Soft Moist	3/64	0.6506	1,232	801.54
Rangens	Soft Moist	1/16	0.6207	3,168	1,966.37
Rangens	Soft Moist	3/32	0.5908	5,060	2,989.45
Rangens	Soft Moist	1/8	0.5908	6,587	3,891.60
Rangens	Soft Moist	5/32	0.5908	836	493.91
SUBTOTAL	SOFT MOIST			17,639	10,671.61
GRAND TOTAL	ALL DIETS			113,200	36,475.58

Appendix H. Relationship of Grace Hatchery stocked fish fin length to wild fish fin length, and Fat Index.

Date	Species	Fork Length (mm)	Fin Length (mm)	% of Wild Fish Fin Length	Fat Index
2-11	Rainbow	233.2	21.0	69	N/A
3-22	Rainbow	229.5	21.9	73	N/A
5-3	Rainbow	227.4	20.2	68	2.5
5-5	Rainbow	224.1	21.9	75	1.45
9-20	Rainbow	146.7	14.3	75	0.45
9-20	Rainbow	149.7	12.5	64	1.25

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

HAGERMAN FISH HATCHERY

1993

By:

Thomas S. Frew, Fish Hatchery Superintendent III

INTRODUCTION

Hagerman Hatchery is a state-owned resident trout production facility. The hatchery raises several strains of rainbow trout and various specialty species for statewide distribution. Hagerman Hatchery is the Idaho Department of Fish and Game's (IDFG) largest resident trout production facility. Built in 1947, it is located approximately 30 miles west of Twin Falls on the Snake River.

Funding is provided through IDFG licence money. There was approximately $371,070.00 from Hagerman's budget, and approximately $90,000.00 from the fish transportation budget used to rear and plant the fish year 1993 production, not including capital outlay expenditures.

The hatchery is staffed with four permanent employees and two permanent transport operators. Twenty months of temporary labor are available for use during the year.

The hatchery water supply consists of approximately 42 cubic feet per second (cfs) from Tucker Springs and approximately 61 cfs from Riley Creek. The Tucker springs water serves the 2,520 cubic feet of rearing space in the hatchery building, 10,530 cubic feet of rearing space in fingerling ponds, and up to 118,560 cubic feet of rearing space in large production raceways. Riley Creek water supplies the 287,280 cubic feet of rearing space available in 12 additional raceways. The Tucker Springs water is a constant 59^{o}F year-around and Riley Creek fluctuates from 52^{o}F to 62^{o}F on an annual basis.

HATCHERY PRODUCTION

Hagerman Hatchery reared and planted 4,256,606 fish during fish year 1993. Of these, 775,299 were planted when 8 inches long and larger, and 3,481,307 were planted smaller than 8 inches long (Appendices A, B, and C). The larger fish were rainbow trout, Kamloops trout of various strains, and Lahontan cutthroat trout, while the 3- to 8-inch fish consisted of rainbow trout, Kamloops trout, two strains of cutthroat, Coho salmon, brown trout, and cutthroat x rainbow hybrids (Appendix B). In addition to the requests from the regions, 1,526,469 rainbow trout weighing 92,671 pounds that were donated by Clear Springs Trout Company and 4,078 rainbow trout weighing 1,230 pounds from the Hagerman Tunison Laboratory were planted by the hatchery crew. The fish transportation operation hauled 1,742 mackinaw weighing 3,340 pounds from Creston National Hatchery, 16,000 Mt. Shasta rainbow weighing 2,000 pounds from Garrison National Hatchery, and 1,500 tiger muskies from a private hatchery in Minnesota to Idaho's waters, in addition to their regular hauling duties.

The 425,424 pounds produced included 257,748 pounds of put-and-take fish averaging 9.075 inches that were planted in state waters, and 167,676 pounds of fingerlings that averaged 5.22 inches were planted. The cost of producing and planting the average 10.00 fish per pound (5.43 inches) fish was approximately $1.0837 per pound, or $108.37 per 1,000 fish, or $0.0199 (1.99 cents) per inch for the average 5.43-inch long fish reared (Appendix C).

A total of 6,015,610 eggs were acquired to yield the fish produced. A total of 675,750 eggs were purchased, and the remaining 5,339,860 eggs were acquired from governmental sources at no cost (Appendix D). A total of 1,113,821 fish were transferred into the Hagerman Hatchery from other hatcheries to ease the loading during the spring and to help meet the fall size requirements (Appendix D).

HATCHERY IMPROVEMENTS

Several hatchery improvements were completed this year. A lot of time was spent this year on hatchery grounds maintenance. The crew cleaned up a lot of miscellaneous brush and trees around the sewage treatment pond and settling pond and rebuilt sections of the settling pond dike where muskrats had breached it. Several loads of scrap iron were hauled to the recycle center and the money was turned over to the region for proper handling.

The Engineering Bureau was called to replace a rotted-out domestic water line and did a good job. The shop's entire electrical system was upgraded, as was the electrical system in the hatch house after a storm overloaded it and burned up a lot of the wiring. Many hours were expended on the bird exclosure system. All of the Tucker Springs raceways were enclosed, and fish survival has been improved in these raceways as a result. Several smaller jobs pertaining to the upgrading of the residences were accomplished in 1993. New linoleum was installed in residence #1, all of the ceilings were insulated with additional insulation, and new vinyl windows were installed in residence #3.

Capitol outlay expenditures included a new riding lawn mower, bulk fry feed storage near the small raceways, and a fry feed blower to feed the large raceways.

The Hatcheries Manager and the Resident Hatcheries Supervisor spent a lot of time developing a long-range rebuild plan for the hatchery and grounds. This plan should set some obtainable goals for the hatchery operation.

Other improvements included modification and fine tuning of fish loading rates in the raceways, feeding rates, and diets for the eleven different species and strains of fishes reared this year at Hagerman.

The Engineering Bureau has budgeted money to install a pipeline to carry the Tucker Springs water to the raceways instead of the present open ditch system. This work is scheduled to be performed during 1994. The hatchery needs money to be appropriated to screen and stabilize the quality of the intake water from Riley Creek.

These improvements were recommended by the Eagle Fish Health Laboratory in 1985 as part of an overall plan to control mortality at Hagerman, and these items have been cut from the budget for the past five consecutive years. These are crucial steps needed to eliminate the Infectious Hematopoietic Necrosis (IHN) and other diseases that Hagerman has experienced for the past 16 years.

FISH HEALTH

Some significant steps in managing the fish disease problems at Hagerman Hatchery were taken in 1993. First, all the outside raceways on Tucker Springs water are now screened or netted to keep out the birds which have played a significant roll in both transmission of diseases and in unseen depredation losses. Episodes of infectious hematopoietic necrosis (IHN) have been reduced in number and isolated in nature because the chances for horizontal transmission between raceways have been reduced. The benefit from the netting is a hatchery-wide increase in fish survival from egg to stocking. Overall survival in 1993 was 60.4%, compared to about 40% in previous years. (This number would have been even better if the Lewis River coho, which suffered 70+% losses before first feeding, were not included). Another important step in disease management was

the development of a long-range reconstruction plan which could lead to better isolation of fish on clean spring water, better overall water management on the hatchery, and a possible redirection of production goals. A major benefit from improving the disease status of Hagerman Hatchery, in addition to healthier fish and better survival, would be greater leeway in where the hatchery product could be stocked.

Pathologists from the Eagle Fish Health Laboratory visited Hagerman Hatchery on eight occasions (Appendix E). Fish sampled included several lots of rainbow and Kamloop trout, Lahontan cutthroat trout, and coho salmon. The laboratory detected IHN virus from both Hayspur and Trout Lodge rainbow trout and from one sampling of coho salmon. Two subsequent samplings from the coho were negative for all viruses. The coho suffered significant losses between the time the eggs hatched and the fry went on feed, but signs were not consistent with IHN disease. Hatchery personnel feel the problem was coagulated yolk resulting from environmental stress, specifically the warm water temperature (59^{o}F). Susceptibility to coagulated yolk seems to differ between stocks of fishes. Coho from other sources have been reared successfully at Hagerman, but this was the first time fish from the Lewis River Hatchery (Washington State) were ever tried here. In addition, the last inspection of the coho detected Renibacterium salmoninarum (RS), the causative organism of bacterial kidney disease (BKD), at ELISA low levels. This was a first finding from coho in Idaho in several years. Signs of clinical disease were not evident.

Coldwater disease (CWD), caused by Flexibacter psychrophilus, was diagnosed in several lots of fish. Oxytetracycline (OTC), in the form of TM-feeds, has been successfully used to treat CWD at Hagerman. However, concerns over the possible development of drug-resistant strains of bacteria need to be considered in the future. No OTC-resistant isolates of Flexibacter sp. have yet been found at Hagerman, but at least one isolate of resistant Aeromonas hydrophila was detected there in 1993. Reduction of stress to avoid outbreaks of diseases, along with a general reduction in the use of chemical therapeutants, are strongly recommended for Hagerman Hatchery. Vertical transmission within the eggs may also be a factor in the CWD problems at several hatcheries. Injection of OTC into broodstock at Hayspur Hatchery may help reduce transmission. There is very likely an interaction between CWD and IHN, in that the bacterial disease may be a precursor to the viral disease, as well as possibly mediating the severity of the viral episode.

Motile aeromonads (A. hydrophila, A. sobria, etc.) are often isolated from fish at Hagerman. These are common bacteria, and are most often secondary rather than primary pathogens. If a fish's defenses are not compromised by other factors, these organisms are usually not a problem. Control or management of the more significant diseases at Hagerman should also reduce the impact of motile aeromonads.

Another bacterial pathogen detected in rainbow trout at Hagerman in 1993 was Flexibacter columnaris. It was isolated concomitant with infections of IHN virus and F. psychrophilus. Oxytetracycline may be effective in treating systemic infections of columnaris disease, but there are no external therapeutants which are FDA approved.

Parasites are also significant problems at Hagerman Hatchery, particularly among fish reared in Riley Creek water. Proliferative kidney disease (PKD) was discovered in the Lahontan cutthroat trout on May 27. This was the first recurrence of PKD documented in the Eagle Fish Health Laboratory database since 1990. These fish were intended for stocking in Island Park Reservoir, but were diverted to Mud Lake because of the disease. Fortunately, healthy replacement fish for the Island Park program were available from another hatchery. No chemical treatment is yet known to eliminate the PKD organism. Avoidance is the

best strategy available, followed by rearing only species of fish with lower susceptibility to the PKD organism. Cutthroat seem to be more susceptible and should not be reared on Riley Creek water, where the organism seems to be isolated. Methods are being investigated at the Eagle Lab for easier detection of PKD, which will make earlier diagnosis possible, as well as facilitating inspections for wild or feral fish.

Another internal parasite which caused significant management problems in 1993 was the blood fluke Sanguinicola klamathensis. This digenetic trematode has a secondary snail host and has been present in the Riley Creek water for many years. Miracidia within a fish migrate to the gill filaments and form aneurysms which normally rupture one at a time and do not cause the fish any serious distress. However, when the fish are loaded on transport trucks at the hatchery, the physical handling causes many of the aneurysms to rupture at once and a number of fish may bleed to death. The resulting blood in the transport tank degrades the water quality, effecting those fish which survived the initial handling. Up to 30% losses on the transport truck have been documented at Hagerman. Post-stocking mortality has not been investigated, but survival is almost certainly reduced. The presence of the infection caused Hagerman Hatchery to postpone stocking approximately 195,000 pounds of fish in state waters until cooler water temperatures slowed replication of the fluke. This delay certainly impacted the management programs in several regions, as well as increasing the operating costs of the hatchery by requiring the use of more fish feed and more man-hours of labor. Again, there seem to be some species-specific differences in susceptibility to the organism, with rainbow being somewhat more resistant than cutthrout, but not enough so to be of much management value at Hagerman.

No practical method to control Sanguinicola sp. in Riley Creek has been found. Other states have used elaborate water treatment techniques, which are prohibitively expensive. Antihelminthics to treat infected food fish are not approved by the FDA. Eliminating the snail intermediate host in Riley Creek is not practical, either. The best suggestion at this stage is to avoid infection by rearing fish on Tucker Spring water instead of Riley Creek. If creek water must be used to meet hatchery production goals, the hatchery manager should attempt to shorten the exposure time as much as possible during the months of warmest water. There is no evidence to date that the parasite has been spread with Hagerman fish to other waters in the state, perhaps because the intermediate host is not widespread or because no one has looked.

Finally, Ichthyobodo sp. (Costia), was found on a group of Kamloop trout in October. Formalin, at up to 170 mg/l for one hour, is the approved chemical treatment for external protozoa. Changing pond management (reduced density, frequent cleaning, etc.), is a better solution for external parasites at Hagerman Hatchery.

FISH FEED

The fish produced during fish year 1993 were fed a total of 574,248 pounds of feed acquired from the contract sources, Rangens, Inc. and Bio-products (Appendix F). The overall conversion was 1.34 pounds of feed to produce 1 pound of fish, not including the weight of the mortality.

PUBLIC RELATIONS

Hagerman Hatchery receives a large number of visitors and sportsmen throughout the year. The hatchery is surrounded by the Hagerman Wildlife Management Area (WMA). The WMA provides a large variety of outdoor experiences, ranging from fishing and hunting, to watchable wildlife viewing, to family picnic uses.

The hatchery and WMA complex needs to have a comprehensive visitor use plan established to maximize visitor appreciation and the educational value of the area. During 1993, a visitor use and infrastructure analysis was undertaken by the National Park Service concerning the impact that the Hagerman Fossil Beds National Monument will have on the area. Estimates of over 300,000 visitors per year from the first year the signs are installed on the highway are projected. A large portion of these people are going to visit the hatchery and WMA and we should be ready to handle these people. This Monument is projected to be in operation in 1996.

An estimated 20,000 visitors toured the facility and used the surrounding public grounds this year.

Hatchery personnel were called upon to give school tours during the spring, and several talks were presented to the local civic organizations.

FISH TAGGING OPERATIONS

The hatchery crew participated in several tagging operations during the year.

Four of the Region 4 waters that Hagerman planted received clipped fish. Two of the waters, Magic Reservoir and Lake Walcott, received clipped fish as part of a return-to-the-creel study that has been ongoing for the past few years. Two waters, Upper Box Canyon Lake and Dog Creek Reservoir, received fish that need to be traced to see how they perform.

Hayden Lake received right ventral fin-clipped fish as part of an ongoing study on creel returns this year from Hagerman. The results of these tagging and marking efforts should be available from the various regional fishery managers during the summer 1994.

ACKNOWLEDGMENTS

Thanks to the permanent hatchery staff of Walt Rast, David May, and Kevin Price; to the transport operators Ken Taylor and Ralph Taylor; and to the temporaries Mary Rosen, Deborah Cain, and Troy Olney.

The regional fisheries and enforcement personnel Fred Partridge, Jeff Dillon, Richard Holman and Gary Hompland also deserve our gratitude.

Appendix A. Costs of fish produced at Hagerman State Hatchery, FY 1993. Costs reflect all costs budgeted except capital outlay plus $90,000.00 of the fish transportation budget and are based on a weighted average of $0.0199 per inch of fish planted ($461,070/23,129,301 inches of fish planted).

Species	Actual Production	Weight Pounds	Costs to Produce and Plant	Cost per 1,000
CATCHABLES 8" and larger				
C6 9"	32,640	6,800	$ 6,550.00	$ 200.67
KS <9"	40,112	10,885	$ 7,500.00	$ 186.98
K1 <9"	33,440	6,725	$ 5,644.17	$ 168.98
K1 >9"	374,608	127,996	$ 73,977.78	$ 197.48
R9 <9"	135,980	45,091	$ 23,262.63	$ 171.00
R9 >9"	27,957	14,187	$ 6,717.25	$ 240.27
RE <9"	44,400	10,800	$ 7,765.87	$ 174.91
RE >9"	78,242	33,364	$ 16,905.95	$ 216.07
SUBTOTALS	775,299	257,748	$149,696.88	$ 193.08
FINGERLINGS smaller than 8"				
BN 5.5"	22,500	1,500	$ 3,200.00	$ 142.22
C3 4"	200,625	2,775	$ 16,050.00	$ 80.00
C4 2-5"	149,275	2,575	$ 12,333.75	$ 82.62
CO 4.5"	185,750	4,300	$ 16,091.30	$ 86.63
K1 5-7.5"	248,000	17,490	$ 28,980.00	$ 116.85
KS 6"	80,400	10,112	$ 10,451.60	$ 129.99
R1 2.5-5"	495,285	12,750	$ 35,272.85	$ 71.22
R9 2-7.8"	1,948,662	107,659	$172,119.62	$ 88.33
RC 3-4"	51,050	1,415	$ 4,767.20	$ 93.38
RE 6"	99,760	7,200	$ 12,106.80	$ 121.36
SUBTOTALS	3,481,307	167,676	$311,373.12	$ 89.44
TOTALS	4,256,606	425,424	$461,070.00	$ 108.32

Appendix B. Fish survival from eyed egg to plant, 1993.

Species/ Strain	Number Planted	On hand 12/31/93	Total Produced	Percent Survival
KS Troutlodge	121,592		121,592	26.33
K1 Hayspur and Gloyd Springs	656,042		656,048	80.53
RE Erwin	224,402		224,402	39.24
R9 Hayspur	2,117,439		2,117,439	65.91
R1 Harrison Lake	495,285		495,285	89.83
RC Henrys Lake	51,050	244,706	295,756	55.78
C3 Henrys Lake	200,625		200,695	76.52
C4 Tensleep, WY	149,275		149,275	84.17
C6 Nampa	32,640		32,640	35.14
Coho	185,750		185,750	25.6
Brown	22,500		22,500	63.44
Total	4,256,606	244,706	4,491,312	60.41%

Appendix C. Fish distribution from Hagerman State Hatchery 1993.

Species	Number	Pounds	Percent Planted in Region 1	2	3	4	5	6
C6	32,640	6,800	-	-	-	-	-	100
K1	408,048	134,721	-	-	72.1	28.3	8.2	2.4
KS	40,112	10,885	-	-	10.0	90.0	-	-
R9	163,937	59,278	-	-	25.1	44.8	24.0	6.1
RE	122,642	44,164	-	-	-	71.1	28.9	-
SUBTOTAL Catchables	775,299	257,748	0.0	0.0	39	40.3	13.9	6.8
BN	22,500	1,500	-	-	-	100	-	-
C3	200,625	2,775	-	-	-	100	-	-
C4	149,275	2,575	-	-	-	100	-	-
CO	185,750	4,300	-	-	100	-	-	-
K1	248,000	17,490	-	-	8.1	72.6	19.3	-
KS	80,400	10,112	100	-	-	-	-	-
R1	495,285	12,750	-	-	21.9	37.7	-	40.4
R9	1,948,662	107,659	-	-	19.2	63.2	6.4	11.2
RC	51,050	1,415	-	-	-	97.9	-	2.1
RE	99,760	7,200	-	-	86.4	13.6	-	-
SUBTOTAL Fingerlings	3,481,307	167,676	2.3	0	22.2	58.4	5.0	12.1
TOTAL	4,256,606	425,424	1.9	0	25.3	54.9	6.8	11.1

Appendix D. Numbers of eyed eggs received, species, and source.

Species/ Strain	Number Received	Source
rainbow/ Kamloop	214,000	Gloyd Springs Washington
rainbow, Kamloop x steelhead	461,750	Troutlodge Washington
rainbow/ Kamloop	461,954	IDFG Hayspur
rainbow/ Erwin	571,755	USFWS Ennis, Montana
rainbow/ Harrison Lake	551,380	USFWS Ennis, Montana
rainbow/ Hayspur	recd as fry 1,078,353	IDFG Cabinet Gorge hatchery
rainbow/ Hayspur	2,134,199	IDFG Hayspur
RC Hybrid	530,168	IDFG Henrys Lake
Henrys Lake cutthroat	262,175	IDFG Henrys Lake
Snake River cutthroat	103,125	Wyoming DNR Tensleep, Wyoming
coho	725,104	Washington Dept. of Fish Lewis River Hatchery
brown trout	35,486 recd as fry	IDFG Mackay hatchery
TOTALS	6,015,610 eggs 1,113,821 fry	
K1 on hand 1/1/93	138,693	
C4 on hand 1/1/93	74,214	
C6 on hand 1/1/93	92,900	
	7,435,238	available to produce the 1993 plants

Appendix E. Summary report of Eagle Fish Health Laboratory results for Hagerman Hatchery (Class C), January 1 - December 31, 1993.

Brood year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
1992	Hayspur	Rainbow	93-009		+	-			-	-	+		-			DX: IHN, Bacteremia, CWD; Viro 1/2 pools, F. psychrophilus 2/6, Aeromonas hydrophila 6/6 (OTC resistant), Pseudomonas 2/6, WHD 0/1
1992	Hayspur	Kamloop	93-121		-	-			-	-	-					DX: Undetermined etiology; Viro 0/10
1992	Lewis R.	Coho	93-122		+	-					+					DX: IHN, CWD, MAS; IHNV 2/2, Flexibacter psychrophilus 2/8, Aeromonas (motile) 2/8
1992	Lewis R.	Coho	93-171		-	-			-	-	-					DX: Undetermined etiology, Bacteremia (light); Viro 0/10, Aeromonas sobria 1/8
1992	Hayspur	Rainbow	93-173		+	-			-	-	+					DX: IHN, CWD, Columnaris disease; Viro 2/2 pools, F. psychrophilus 8/8, F. columnaris 6/8
1992	Lahontan	Cutthroat	93-216		-	-					-	+				DX: PKD, Bacteremia; Viro 0/15, PKX 1/1, Flexibacter sp. 9/10
1992	Lahontan	Cutthroat	93-226					-	-	-		+				DX: PKD,Trematodiasis (Sanguinicola); PKX 1/1
1992	Hayspur	Kamloop	93-227					-	-	-		+				DX: Mult. Parasitisms Sanguinicola (low), PKX (presumptive); Bacte 0/1
1992	Erwin	Rainbow	93-230						-	-		+				DX: Mult. Parasitisms Sanguinicola (low), PKX (presumptive), Bacte 0/1
1992	Lewis R.	Coho	93-419		-	-		+	-	-	-					IX: RS; ELISA 10/12 (low), FA 1/12, Viro 0/60, Bacte NSG
1993	TroutLdg	Kamloop	93-494		-	-										DX: Ichthyobodiasis (Costiasis); Viro 0/20
1993	TroutLdg	Kamloop	93-513		-	-			-	-	-					DX: Undetermined etiology, Bacteremia; Viro 0/10, Aeromonas hydrophila 2/8 (low growth probably not causing mortalities)

IHN Infectious Hematopoietic Necrosis virus
IPN Infectious Pancreatic Necrosis virus
EIBS Erythrocytic Inclusion Body Syndrome virus
BKD Bacterial Kidney Disease (Renibacterium salmoninarum)
RS Positive for Renibacterium salmoninarum but not clinical disease
FUR Bacterial Furunculosis (Aeromonas salmonicida)
ERM Enteric Redmouth Disease (Yersinia ruckeri)
CWD Coldwater Disease (Flexibacter psychrophilus)
PKD Proliferative Kidney Disease (PKX)
WHD Whirling Disease (Myxosoma cerebralis)
CSH Ceratomyxa shasta
ICH Ichthyophthirius multifilis
GBD Gas Bubble Disease
MAS Motile Aeromonad Septicemia
NSG Nonsignificant Growth

IX Inspection (routine hatchery visit)
DX Diagnostic (sampled because of sick fish)

Appendix F. Fish feed used during Fish Year 1993 at Hagerman Hatchery.

Size	Source	Pounds	Cost/ pound	Cost
#2/TM,#3/TM	Rangens	1,300	$0.5065	$ 658.45
#3	Rangens	150	$0.4440	$ 66.60
#4/TM	Rangens	3,000	$0.5065	$ 1,519.50
#4 Crumble	Rangens	2,200	$0.2928	$ 644.16
3/32"Pellet	Rangens	137,640	$0.2382	$ 32,785.85
1/8" Pellet Lo Phos	Rangens	133,010	$0.2806	$ 37,322.61
5/32"Pellet	Rangens	78,280	$0.2382	$ 18,646.30
5/32"Pellet Lo Phos	Rangens	117,330	$0.2806	$ 32,922.80
Soft-Moist 1/16	Rangens	528	$0.6207	$ 327.73
Soft Moist 1/8	Rangens	880	$0.5908	$ 519.90
Soft Moist 3/32	Rangens	1,980	$0.5908	$ 1,169.78
#1,2,3	Bioproducts	1,804	$1.082	$ 580.94
Biodiet#3/TM	Bioproducts	2,596	$1.25	$ 3,245.00
Biodry 1000	Bioproducts			
1.0mm		7,650	$0.575	$ 4,398.75
1.3mm		4,900	$0.575	$ 2,817.50
1.5mm		9,850	$0.53	$ 5,220.50
2.0mm		9,600	$0.53	$ 5,088.00
2.5mm		12,650	$0.44	$ 5,566.00
4.0mm		1,400	$0.44	$ 616.00
Biodry 500	Bioproducts			
1.0mm		50	$0.49	$ 24.50
1.5mm		4,050	$0.49	$ 1,984.50
2.0mm		9,900	$0.49	$ 4,851.00
2.5mm		18,400	$0.44	$ 8,096.00
Biodry 4000	Bioproducts			
4.0mm		3,000	$0.55	$ 1,650.00
Biodiet	Bioproducts			
1.0mm		3,388	$0.855	$ 2,896.74
1.3mm		1,056	$0.809	$ 854.30
1.5mm		6,468	$0.809	$ 5,232.61
2.5mm		1,188	$0.684	$ 812.59
Totals		574,248	$0.3164	$181,738.10

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

HAYSPUR FISH HATCHERY

1993

Prepared by:

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INTRODUCTION

Hayspur Fish Hatchery is a license-funded resident salmonid broodstock and production facility. Two captive broodstocks, rainbow trout Oncorhynchus mykiss (designated R9 or Hayspur strain) and a Kamloop population (designated K1 derived from Skanes/Gloyd Springs stock) are maintained on station. Since the start of renovation in 1989, eyed egg production for seven resident hatcheries has been a priority. Catchables and fingerling are reared for stocking into waters of Magic valley, Salmon, and Panhandle regions.

The hatchery is located in Blaine County, approximately 40 miles south of Sun Valley, on Loving Creek. Fish culture facilities include an incubation building housing Heath stacks, isolation incubators, moist egg chiller, early rearing troughs, a hatchery building with 20 early rearing tanks, 8 covered 24-foot circular ponds, 6 small fingerling tanks, 6 large production raceways, and an earthen brood pond.

Water sources include the Hayspur Spring which supplies 3.0 to 5.5 cfs of water at 52^{o}F (11.6^{o}C), three pumped artesian wells producing 5.0 cfs water at 52^{o}F to 48^{o}F, and Loving Creek producing 7.4 to 18 cfs of water at 33^{o}F to 73^{o}F (5.5^{o}C to 22.7^{o}C).

Personnel consists of three permanent employees (Fish Hatchery Superintendent II, Fish Hatchery Superintendent I, Fish Culturist) and 16.6 months of temporary Bio-Aide time. Usually three Bio-Aides are hired for spawning season and one for the summer field season.

RAINBOW AND KAMLOOP EGG PRODUCTION

Spawning season has become an eight-month project with an egg take of 10,087,038 eggs during the period covered. Photoperiod manipulation or light control and a moist egg chiller has expanded the "normal" spawn timing to closer match egg requests of seven resident hatcheries. A total of 7,889,161 eyed eggs were produced. Rainbow trout eyed egg production totaled 6,674,350. Kamloop eyed egg production totaled 1,359,093. Hagerman, Nampa, American Falls, Grace, Ashton, Clark Fork, and Hayspur hatcheries were shipped eggs as per their requests. Cabinet Gorge and Sandpoint hatcheries were shipped eggs outside requested time frames or in excess of requests. The very last eggs were shipped to McCall Hatchery as green eggs for the mountain lake program (Appendix A).

On March 9, 1993 an evaluation form was sent to nine hatchery managers that had received eggs from the 1992/1993 season at Hayspur Hatchery. They were asked to respond to seven parameters: notice of shipment, condition on arrival, quantity, quality, timing, performance, and any constructive criticisms. These were used to find any shortcomings or to better improve eyed egg shipments. Comments from the managers produced several implemented procedures for the 1993/1994 egg taking season:

1. Better labeling when Whitco egg shipment boxes are not used; ie. "This side up" and "Live Fish Eggs" to perhaps eliminate the rough handling by Federal Express.

2. Increase the number of ponds on photoperiod manipulation to better meet hatchery managers requests.

3. Oxytetracycline injections (IP) were administered to all female broodstock except the 2-year-olds to impact the vertical transmission of coldwater disease.

FISH PRODUCTION

A total of 394,590 rainbow trout were produced. Catchable production totaled 156,345 fish weighing 62,552 pounds (Appendix B). Hayspur stocked 138,433 catchable rainbow trout into Magic Valley and Salmon regional waters. These fish were stocked into the Big Wood, Little Wood, and upper Salmon river drainages. Catchable rainbow trout were transferred to Mullan and Sawtooth hatcheries. Mullan Hatchery was shipped 17,912 catchables for redistribution into the Coeur d'Alene, St. Maries, and St. Joe river drainages. Sawtooth Hatchery was shipped 58,009 catchables for redistribution into the Salmon River, Salmon River tributaries upstream of the Pahsimeroi River, and Stanley Basin lakes (Appendix C).

On July 16, 1993, National Marine Fisheries Service (NMFS) issued Permit #869 to the Idaho Fish and Game. This permit imposed length limits on catchable rainbow trout planted in the Salmon River drainage to fish under 10 inches. Hayspur initiated a grading program on the catchables that would be transferred to Sawtooth Hatchery. Catchables transferred to Sawtooth Hatchery were 9.98 inches (25 cm) according to NMFS permit #869. Using the Fish Hatchery Management text (Piper, 1982) and the grading system used at Ashton Hatchery (Jerry Chapman), proper gap distances were determined in order to meet the 10-inch requirements. Not only did Hayspur use this for the Salmon River drainage but it was used on the rest of the Hayspur catchables in order to meet the regional size requirements of ten inches or larger. This grading process worked very well and will be continued at Hayspur Hatchery in the future.

Fall fingerling production totaled 154,273 fish weighing 6,609 pounds. Magic Reservoir was stocked with 73,069 fingerling. These fish were 4.89-inch to 4.95-inch fingerling marked with an adipose clip for fishery performance evaluation. Little Wood Reservoir was stocked with 54,000 fingerling. An adipose clip identified this group of fingerling. Fish Creek Reservoir was planted with 10,000 fingerling of 4.98 inches with an adipose clip. Also, 17,204 excess 2.3-inch fingerling were stocked as per the Magic Valley Region's request (Appendix D).

Spring fingerling production involved 83,972 fish weighing 831.25 pounds. Little Wood Reservoir and Fish Creek Reservoir were stocked with these fish. Spring fingerling were 3.05 inches to 3.58 inches.

HATCHERY IMPROVEMENTS

Improvements to the hatchery are:

1. The oldest residence was replaced with a modular home from R-Homes in Pocatello.

2. An isolation incubation system to accommodate 100 sub-families of 1:1 pairings was fabricated using Ernie Brannon style down-wellers assembled by Eagle Sockeye Research personnel.

3. Well #4 was piped into the headbox with 582 feet of 8-inch diameter PVC. This 800 gpm well will provide water for four proposed circular ponds.

4. Native water birch and red osier dogwood from the Nature Conservancy were planted along the Loving Creek rehabilitated area.

5. A database for spawn taking and egg shipment information was developed.

6. The site for a volunteer Campground Host was improved and signed.

Needs of the hatchery listed in order of priority

1. Replace domestic water line and domestic pump/pressure tank.

2. Scarify and resurface entrance road.

3. Replace roof of spring house.

BROODSTOCK MANAGEMENT

Spawning season at Hayspur has been a dynamic project in terms of capability, requests, genetic management, and pathogen status. Major issues dealt with during the period covered include isolation incubation system upgrade, equal contribution of families from 1:1 pairings, 10% integration of feral rainbows trapped from Loving Creek, and criteria for managing BKD pertaining to results of direct FAT, modified FAT, and ELISA. Eyed egg requests have increased, especially the number outside the "normal" time frame. Four circular ponds involving three rainbow and one Kamloop population were placed on photoperiod manipulation. Isolation incubation for sub-families of 1:1 pairings was upgraded. Keith Johnson provided design, component, and assembly assistance on 100 down-welling incubators. These incubators provided sub-family identification and equal number contribution to future broodstock population. Also, progeny could be held until results from the Eagle Fish Health Laboratory were obtained and cull decisions agreed upon. ELISA and modified FAT techniques/results lead to more stringent culling of sub-families (see Fish Health section). Also, feral rainbows were trapped from Loving Creek. These fish are thought to have demonstrated survival in the wild and provide gametes from the "founding" population. Of 200 pairings used for the broodstock replacement population, 20 adults from Loving Creek were used.

FISH FEED

A prophylactic treatment of TM-100 was administered to the production fish in Loving Creek water. This treatment was an effort to avoid the historic outbreak of coldwater disease. Mortality remained low throughout the January to February time frame usually associated with a coldwater disease outbreak.

Broodstock were fed Rangen's 1/4-inch pellet with 150 grams per ton canthaxathin. This additive provides acceptable egg color, but controversy remains as to quality and/or health benefits (Appendix E).

FISH HEALTH

Intensive sampling and culling of the replacement broodstock pairings was the fish health priority at Hayspur this year. A total of 199 pairs of Hayspur broodstock were tested, with ovarian fluids collected from every female for virology and modified fluorescent antibody (MFAT) analysis. In addition, 69 of these females were sacrificed for enzyme-linked immunosorbent assay (ELISA),

direct fluorescent antibody (DFAT), virology, and whirling disease tests. Individual results are presented in Appendix F. No viruses or whirling disease organisms were detected. A total of 41 females (20.6%) tested positive for Renibacterium salmoninarum (RS) by either or both ELISA and MFAT. No positives were detected using the traditional DFAT method, nor were clinical signs of disease observed in any fish. A summary of results from the different BKD test methods is presented in Appendix G, while a comparison of ELISA and MFAT results from the same females is presented in Appendix H. Eleven mature female and 12 mature male rainbow trout were captured below the hatchery and utilized in the above pairings to infuse "feral" genetics into the hatchery broodstock. The feral females were all sacrificed for disease samples and are included in the numbers reported in Appendices F and G, accounting for 11 ELISA (low) positives and 2 MFAT positives. All feral males were sacrificed for disease analysis (Appendix I). Clinical signs of bacterial kidney disease (BKD) do not manifest themselves in Hayspur rainbow trout, but the transmissibility of the RS is strongly indicated by the fact that 82.6% of the feral fish tested from below the hatchery (19 of 23) were ELISA positive.

Modifications were made in the criteria for culling eggs intended for future broodstock. Past culling was done solely on positive virus tests and on positive DFAT results for RS. It became evident from the use of ELISA and MFAT that DFAT was not sensitive enough to detect nonclinical infections of RS at Hayspur Hatchery. The hatchery manager and resident pathologist proposed culling eggs from all females which test positive for any virus, from all which test RS positive by either MFAT or DFAT, and from all which test RS positive by ELISA at optical densities $\geq$0.025. These criteria were implemented by the fourth spawning date (11/24). The result of this protocol was the culling of several more egg groups than anticipated, so additional pairings were made to assure a minimum of 150 pairs for future broodstock.

Additional broodstock sampling included 20 males from pond 7 (Accession 93-558), the 62 fish from the 2-year-old Hayspur rainbow in small raceway 6 (Accession 93-560), and 4 post-spawning females from pond 1 (Accession 93-597). All were negative for replicating viruses. The fish from pond 7 were 35% RS positive by ELISA (5 low, 1 moderate, 1 high), and the 2-year-olds had 1 ELISA low (1.6%). The post-spawning females had an extreme bacterial septicemia consisting of Pseudomonas and Streptococcus species (Appendix J). No treatment for the post-spawning problem was applied in 1993, but antibiotic injections at spawning have been suggested for use in the future.

Diagnostic inspections were made on the production rainbow on three occasions (Appendix J). Bacterial septicemia, with concomitant infections of Aeromonas hydrophila and Flexibacter psychrophilus, was the most frequent diagnosis. External mycosis (fungus infection) was also frequently observed, although the problem was not extensive and was probably secondary to the Flexibacter infections.

Salt treatments (sodium chloride) were frequently used on both production and brood fish. These treatments were intended to reduce external parasites, alleviate bacterial/environmental gill disease, aid in osmoregulation, and generally reduce stress. No empirical data was collected, but hatchery personnel feel that benefits from such salt treatments outweigh the minimal cost and effort involved.

Recommendations for 1994 include:

1. Implement new egg culling protocol for all broodstock replacement lots.
2. Set up a replicated experiment to test hydrogen peroxide as an antifungal treatment for rainbow trout eggs.

3. Set up a replicated experiment to test spawn-day injection of females with Sarafloxacin to improve post-spawning survival.

4. Minimize prophylactic use of oxytetracycline in production lots to avoid creating resistant strains of bacteria.

PUBLIC RELATIONS

Tours were given to area schools. Bellevue Elementary, Hailey Elementary, Hailey Middle School, Hemingway School (Ketchum), Cornerstone Academy (Ketchum), and the College of Southern Idaho aquaculture students were among the touring groups. Organized groups, such as Flyfishers of Idaho, Good Sam RV Club of Jerome, and Boy Scouts were given tours.

Eyed eggs were shipped to the Naples School and Kellog School located in the Panhandle Region. Resultant fry were stocked out into area waters as part of adopt-a-stream projects.

Approximately 7,000 people visited, camped, and/or fished Gaver Lagoon or Loving Creek on hatchery property. Gaver Lagoon continues to be a popular fishery for a variety of anglers,including the physically challenged and kids. A national level field trial event for retrievers was held during the summer.

Hayspur personnel assisted regional fishery staff with electrofishing surveys on the Big Wood River and gillnetting Baker Lake. We helped out at big game and upland bird check stations. Personnel provided hard evidence of a stream alteration violation which lead to a conviction and fine. Personnel also were active in an electrofishing study by Rick Wilkinson of Idaho State University on population dynamics and food habits of brown trout in Silver Creek.

Hatchery personnel were featured on "Incredible Idaho" and a couple of spots on KMVT television station pertaining to the spawning operation. The Hayspur Campground enjoyed the efforts of a volunteer Camp Host. George and Pat Allen volunteered time to answer questions, give directions, tidy up outhouses, clean up litter, and enhanced the image of the Department.

FIN QUALITY

Fin quality continues to be monitored. The Ashton method was used on a 20-fish sample from each of the six large catchable raceways. Fin ratio averages from these fish compared to wild fish fin ratios were as follows: Raceway A = 57%, Raceway B = 54%, Raceway C = 60%, Raceway D = 52%, Raceway E = 55%, and Raceway F = 55%. This demonstrates validity of the goal of 70% at Hayspur.

SPECIAL PROJECTS

Loving Creek Rehabilitation Project

During a work day involving the Flyfishers of Idaho and Hayspur personnel, two benches were installed, 10 tons of large rocks were placed to reduce bank cutting, and native shrubs were planted along the Loving Creek project. The fishery was a real highlight! Guides and outfitters brought clients to fish the project. At least six fish over 20 inches were caught and verified. Five

species of mayflies were observed on the rehabilitated section. Angler sign-in comments reflect good fishing and support of the project.

Baker Lake Golden Trout Project

Hayspur staff operates a golden trout trapping and spawning project at Baker Lake. Baker Lake (elevation 8,796 ft) is an alpine lake of 12 surface acres in the upper Big Wood River drainage. The lake, located 30 miles northwest of Sun Valley, is reached by way of a 1 1/4-mile hike from a trailhead at the end of Baker Creek road.

The trap was not installed this season. Due to poor trapping results in the past, it was decided to gill net the lake in an effort to remove undesirable species, resultant biomass, and evaluate population dynamics. Results of this July 11-13 effort are found below:

Species	Number	Size	Comments
Golden	8	190 mm-370 mm	4 Lv, 2 Ad clips
Cutthroat	68	100 mm-400 mm	
Brown	15	300 mm-500 mm	
Rainbow	6	100 mm-300 mm	

A monitored public fishing event was held July 3-5 with regional fishery management and hatchery personnel in attendance. A total of eight cutthroat, three rainbow x cutthroat hybrids, one rainbow, and one brown trout were caught and removed. These fish were dressed and given to indigent of the area through Health and Welfare.

On August 18, 1993, Baker Lake was stocked with 840 golden trout fingerlings of Wyoming stock. The fingerlings averaged 20 fish per pound and were in great shape. These fish were stocked via Forest Service helicopter and hard bucket.

ACKNOWLEDGEMENTS

The efforts of Bio-Aides Jason Bradley, Mike Paddock, Kurt Stieglitz, and Mark Winn are to be commended. Mike Paddock was instrumental during the stocking season. Jason, Mark, and Kurt did a great job during the entire spawning season. Special thanks to Aaron Telford (Education Coop member), Cameron Cook, and Angel Brodie (JTPA) for all their help.

Appendix A. Egg shipment summary, 1993.

Hatchery	Species	Total eggs shipped
American Falls	R9	538,674
Ashton	R9	90,128
	K1	135,103
Cabinet Gorge	R9	905,804
Clark Fork	R9	0
	K1	252,614
Grace	R9	913,327
	K1	44,192
Hagerman	R9	1,745,517
	K1	926,900
Hayspur	R9	691,248
McCall	R9 + K1	60,000
Nampa	R9	523,587
TOTAL		6,827,094 *

*Eggs were also sent to the Kellog Elementary (2,000) and to the Naples School (1,000) as educational groups. Hayspur also sent separate gametes to the University of Wisconsin for experimental purposes.

Appendix B. Hatchery production cost summary, 1993.

Fish size	Number of fish	Pounds of fish
Catchables	156,345	62,552
Fingerlings	238,245	7,440
TOTAL	394,590	69,992

Total hatchery operation costs	$178,300.00
Hatchery cost per fish	$0.451
Hatchery cost per pound	$2.55

Appendix C. Fish transfer summary, 1993.

Shipped from	Received	Average size	Number of of fish
Nampa	Hayspur	17.0-20.0 inches	3,279-R9
Nampa	Hayspur	19.0-22.0 inches	1,480-K1
Hayspur	Nampa	4.1- 4.5 inches*	5,000
Hayspur	Mullan/Clark Fork	9.5-11.0 inches	17,912
Hayspur	Sawtooth	9.5-14.5 inches	58,009
TOTAL			85,676

*Fingerlings for Hayspur broodstock replacement in 1993.

Appendix D. Marking data for Hayspur Hatchery fingerlings and catchables, 1991-1993.

Year	Water	Number	Fingerling/ Catchable	Mark/ Clip
1991	Big Wood River	4,350	catchables	Ad clip
1991	Bell Rapids[a]	15,000	catchables	Ad clip
1991	Bell Rapids[a]	2,000	catchables	Floy tag
1991	Magic Reservoir	50,000	fingerlings	Ad clip
1991	Dog Creek Reservoir	150	catchables	Jaw tag
1991	Bellevue Canal	150	catchables	Jaw tag
1991	Baker Lake	531	fingerlings	Ad clip
Total		71,650		
1992	Big Wood River[b]	4,095	catchables	Ad clip
1992	Magic Reservoir	97,345	fingerlings	Ad clip
1992	Little Wood Reservoir	15,000	fingerlings	Ad clip
1992	Little Wood Reservoir	7,600	catchables	Left Max
1992	Baker Lake	630	fingerlings	LV clip
Total		124,670		
1993	Little Wood Reservoir	10,000	catchables	Right Max
1993	Little Wood Reservoir	54,000	fingerlings	Ad clip
1993	Magic Reservoir	35,858	fingerlings	Ad clip
1993	Fish Creek Reservoir	10,000	fingerlings	Ad clip
1993	Big Wood River[b]	3,425	catchables	Ad clip
1993	Baker Lake	840	fingerlings	LV clip
1993	Trail Creek[c]	732	catchables	Jaw tag
1993	Warm Springs Creek[c]	913	catchables	Jaw tag
1993	Big Wood River[c]	725	catchables	Jaw tag
1993	Gaver Lagoon[d]	850	catchables	Floy tag
1993	Magic Reservoir	37,211	fingerlings	Ad clip
Total		154,554		
THREE-YEAR TOTAL		350,874		

[a]Bell Rapids fish were 4.62 fish/pound.
[b]This pland on the Big Wood River is from Croy Creek to Broadford Bridge.
[c]Fish planted for Gregg Mauser's return study.
[d]Fish planted for Gregg Mauser's hooking efficiency study.

Appendix E. Feed fed in the 1993 production year.

Size	Source	Pounds	Cost/ pound	Cost
Swim-up	Rangens	50	0.44	22.20
#1 granules	Rangens	350	0.44	155.20
#2 granules	Rangens	850	0.44	375.40
#3 granules	Rangens	3,500	0.44	1,541.57
#4 crumble	Rangens	11,850	0.28	3,332.88
3/32 " pellet	Rangens	4,500	0.24	1,094.40
1/8 " pellet	Rangens	32,700	0.24	7,699.15
5/32 " pellet	Rangens	81,980	0.22	18,191.63
1/4 " pellet/red 10	Rangens	34,870	0.31	10,689.63
Totals		170,650	$0.25	$43,102.06
#2 granules	Bioproducts	44.10	1.68	74.00
#3 granules	Bioproducts	396.90	1.13	447.92
1.0 mm/Grower	Bioproducts/			
	Biodiet	264.60	0.95	252.61
	Biodry	150.00	0.55	82.50
1.3 mm/Grower	Bioproducts/			
	Biodiet	132.30	1.30	171.61
	Biodry	500.00	0.44	219.00
1.5 mm/Grower	Bioproducts/			
	Biodiet	88.20	1.00	88.61
	Biodry	600.00	0.43	258.00
2.5 mm/Grower	Bioproducts/			
	Biodry	8,000.00	0.25	1,960.00
3.0 mm/Grower	Bioproducts/			
	Biodiet	7,320.60	0.89	6,484.77[a]
	Biodry	8,000.00	0.27	2,120.00
Totals		25,496.70	$0.48	$12,159.02
Final Totals		196,146.70	$0.28	$55,261.08

[a]This order was for TM medicated feed.

Appendix F. Individual disease sample results from female Hayspur-strain broodstock used for paired spawning at Hayspur Hatchery, October-December, 1993. (Feral females denoted by "f").

Sample date	Fish number	ELISA o.d.[a]	MFAT[b]	DFAT[b]	Virus	W.D.	Culled
10/20	1	0.082	0	0	-	-	
	2	0.079	0	0	-	-	
	3	0.102	0	0	-	-	
	4	0.069	0	0	-	-	
	5	0.072	0	0	-	-	
	6	0.088	0	0	-	-	
	7	0.075	0	0	-	-	
	8	0.069	0	0	-	-	
	9	0.082	0	0	-	-	
	10	0.086	0	0	-	-	
	11	0.073	0	0	-	-	
	12	0.073	0	0	-	-	
	13	N.A.	0	N.A.	-	N.A.	
	14	N.A.	0	N.A.	-	N.A.	
	15	N.A.	0	N.A.	-	N.A.	
	16	N.A.	0	N.A.	-	N.A.	
	17	N.A.	0	N.A.	-	N.A.	
	18	N.A.	0	N.A.	-	N.A.	
	19	N.A.	0	N.A.	-	N.A.	
	20	N.A.	0	N.A.	-	N.A.	
11/03	(f)21	0.207	0.5	0	-	-	
	(f)22	0.222	0	0	-	-	
	23	0.079	0	0	-	-	
	24	0.444	TNTC	0	-	-	x
	25	0.069	0	0	-	-	
	26	0.082	3	0	-	-	
	27	0.069	0	0	-	-	
	28	0.070	0	0	-	-	
	29	0.307	4	0	-	-	x
	30	0.063	0	0	-	-	
	31	0.099	1	0	-	-	
	32	0.067	1	0	-	-	
	33	N.A.	0	N.A.	-	N.A.	
	34	N.A.	0	N.A.	-	N.A.	
	35	N.A.	0	N.A.	-	N.A.	
	36	N.A.	0	N.A.	-	N.A.	
	37	N.A.	0	N.A.	-	N.A.	
	38	N.A.	1	N.A.	-	N.A.	
	39	N.A.	1	N.A.	-	N.A.	
	40	N.A.	0	N.A.	-	N.A.	
	41	N.A.	2	N.A.	-	N.A.	
	42	N.A.	0	N.A.	-	N.A.	
	43	N.A.	2	N.A.	-	N.A.	
	44	N.A.	0	N.A.	-	N.A.	
	45	N.A.	1.5	N.A.	-	N.A.	
	46	N.A.	0	N.A.	-	N.A.	
	47	N.A.	0	N.A.	-	N.A.	
	48	N.A.	0	N.A.	-	N.A.	
	49	N.A.	0	N.A.	-	N.A.	

Appendix F. Continued.

Sample date	Fish number	ELISA o.d.[a]	MFAT[b]	DFAT[b]	Virus	W.D.	Culled
	50	N.A.	0	N.A.	-	N.A.	
	51	N.A.	0	N.A.	-	N.A.	
	52	N.A.	0	N.A.	-	N.A.	
	53	N.A.	0	N.A.	-	N.A.	
	54	N.A.	0	N.A.	-	N.A.	
	55	N.A.	0	N.A.	-	N.A.	
	56	N.A.	0	N.A.	-	N.A.	
	57	N.A.	0	N.A.	-	N.A.	
11/17	58	N.A.	0	N.A.	-	N.A.	
	59	N.A.	0	N.A.	-	N.A.	
	60	N.A.	0	N.A.	-	N.A.	
	61	N.A.	0	N.A.	-	N.A.	
	62	N.A.	0	N.A.	-	N.A.	
	63	N.A.	0	N.A.	-	N.A.	
	64	N.A.	0	N.A.	-	N.A.	
	65	N.A.	0	N.A.	-	N.A.	
	66	N.A.	0	N.A.	-	N.A.	
	67	N.A.	0	N.A.	-	N.A.	
	68	N.A.	0	N.A.	-	N.A.	
	69	N.A.	136	N.A.	-	N.A.	x
	70	N.A.	0	N.A.	-	N.A.	x[c]
	71	N.A.	1	N.A.	-	N.A.	
	72	N.A.	0	N.A.	-	N.A.	
	73	N.A.	0	N.A.	-	N.A.	
	74	N.A.	0	N.A.	-	N.A.	
	75	N.A.	0	N.A.	-	N.A.	
	76	N.A.	0	N.A.	-	N.A.	
	77	N.A.	0	N.A.	-	N.A.	
	(f)78	0.105	0	0	-	-	
	79	N.A.	0	N.A.	-	N.A.	
	80	N.A.	0	N.A.	-	N.A.	
	81	N.A.	10	N.A.	-	N.A.	x
	(f)82	0.199	1.5	0	-	-	
	(f)83	0.165	0	0	-	-	
	84	Number 84 was skipped.					
	85	0.066	0	0	-	-	
	86	0.063	0	0	-	-	
	87	0.066	0	0	-	-	
	88	0.064	0	0	-	-	
	89	0.065	0	0	-	-	
	90	0.247	0	0	-	-	
	91	0.065	0	0	-	-	
	92	0.064	0	0	-	-	
	93	0.065	0	0	-	-	
	94	0.066	0	0	-	-	
	95	0.089	0	0	-	-	
	96	0.071	0	0	-	-	
	97	N.A.	0	N.A.	-	N.A.	
	98	N.A.	0	N.A.	-	N.A.	
	99	N.A.	1	N.A.	-	N.A.	
	100	N.A.	0	N.A.	-	N.A.	
	101	N.A.	0	N.A.	-	N.A.	

Appendix F. Continued.

Sample date	Fish number	ELISA o.d.[a]	MFAT[b]	DFAT[b]	Virus	W.D.	Culled
11/24	(f)102	0.109	0	0	-	-	
	103	N.A.	0	N.A.	-	N.A.	
	104	N.A.	0	N.A.	-	N.A.	
	105	N.A.	0	N.A.	-	N.A.	
	106	N.A.	0	N.A.	-	N.A.	x
	107	N.A.	0	N.A.	-	N.A.	
	108	N.A.	0	N.A.	-	N.A.	
	109	N.A.	0	N.A.	-	N.A.	
	110	N.A.	0	N.A.	-	N.A.	
	111	N.A.	0	N.A.	-	N.A.	
	112	N.A.	0	N.A.	-	N.A.	
	113	N.A.	0	N.A.	-	N.A.	
	114	N.A.	0	N.A.	-	N.A.	
	115	N.A.	0	N.A.	-	N.A.	
	116	N.A.	0	N.A.	-	N.A.	
	117	N.A.	0	N.A.	-	N.A.	
	118	N.A.	0	N.A.	-	N.A.	
	119	N.A.	0	N.A.	-	N.A.	
	120	N.A.	0	N.A.	-	N.A.	
	121	N.A.	0	N.A.	-	N.A.	
	122	N.A.	0	N.A.	-	N.A.	
	123	N.A.	0	N.A.	-	N.A.	
	124	N.A.	1	N.A.	-	N.A.	x
	125	N.A.	0	N.A.	-	N.A.	
	126	N.A.	0	N.A.	-	N.A.	
	126	N.A.	0	N.A.	-	N.A.	
	127	N.A.	0	N.A.	-	N.A.	
	128	N.A.	0	N.A.	-	N.A.	
	129	N.A.	0	N.A.	-	N.A.	
	130	N.A.	0.5	N.A.	-	N.A.	x
	131	N.A.	0	N.A.	-	N.A.	
	132	N.A.	0	N.A.	-	N.A.	
	133	N.A.	0	N.A.	-	N.A.	
	134	N.A.	0	N.A.	-	N.A.	
	135	N.A.	0	N.A.	-	N.A.	
	136	N.A.	0	N.A.	-	N.A.	
	137	N.A.	0	N.A.	-	N.A.	
	138	N.A.	0	N.A.	-	N.A.	
	139	N.A.	1	N.A.	-	N.A.	x
	140	N.A.	0	N.A.	-	N.A.	
	141	N.A.	1	N.A.	-	N.A.	x
12/01	(f)142	0.132	0	0	-	-	
	(f)143	0.112	0	0	-	-	
	(f)144	0.220	0	0	-	-	
	145	0.085	1	0	-	-	x
	146	0.089	0	0	-	-	
	147	0.071	0	0	-	-	
	148	0.077	0	0	-	-	
	149	0.074	0	0	-	-	
	150	0.080	1	0	-	-	x
	151	0.593	0	0	-	-	x
	152	0.075	0	0	-	-	

Appendix F. Continued.

Sample date	Fish number	ELISA o.d.[a]	MFAT[b]	DFAT[b]	Virus	W.D.	Culled
	153	0.070	10	0	-	-	x
	154	0.070	0	0	-	-	
	155	0.071	0	0	-	-	
	156	0.086	0	0	-	-	
	157	N.A.	0	N.A.	-	N.A.	
	158	N.A.	0	N.A.	-	N.A.	
	159	N.A.	0	N.A.	-	N.A.	
	160	N.A.	0	N.A.	-	N.A.	
	161	N.A.	7	N.A.	-	N.A.	x
	162	N.A.	0	N.A.	-	N.A.	
	163	N.A.	0	N.A.	-	N.A.	
	164	N.A.	0	N.A.	-	N.A.	
	165	N.A.	0	N.A.	-	N.A.	
	166	N.A.	0	N.A.	-	N.A.	
	167	N.A.	0	N.A.	-	N.A.	
	168	N.A.	0	N.A.	-	N.A.	
	169	N.A.	0	N.A.	-	N.A.	
	170	N.A.	0	N.A.	-	N.A.	
	171	N.A.	0	N.A.	-	N.A.	
	172	N.A.	0	N.A.	-	N.A.	
	173	N.A.	0	N.A.	-	N.A.	
	174	N.A.	0	N.A.	-	N.A.	
	175	N.A.	2	N.A.	-	N.A.	x
	176	N.A.	0	N.A.	-	N.A.	
	177	N.A.	1	N.A.	-	N.A.	x
	178	N.A.	1	N.A.	-	N.A.	x
12/15	(f)179	0.180	0	0	-	-	
	(f)180	0.108	0	0	-	-	
	181	0.305	0	0	-	-	x
	182	0.088	0	0	-	-	
	183	0.082	0	0	-	-	
	184	0.067	0	0	-	-	
	185	0.082	0	0	-	-	
	186	0.065	0	0	-	-	
	187	0.072	0	0	-	-	
	188	0.070	0	0	-	-	
	189	0.083	0	0	-	-	
	190	0.074	0	0	-	-	
	191	0.069	0	0	-	-	
	192	0.227	0	0	-	-	
	193	N.A.	0	N.A.	-	N.A.	
	194	N.A.	0	N.A.	-	N.A.	
	195	N.A.	0	N.A.	-	N.A.	
	196	N.A.	0	N.A.	-	N.A.	
	197	N.A.	0	N.A.	-	N.A.	
	198	N.A.	0	N.A.	-	N.A.	
	199	N.A.	0	N.A.	-	N.A.	
	200	N.A.	0	N.A.	-	N.A.	

[a]Optical density
[b]Organisms per 30 fields
[c]Record-keeping error required culling two lots to guarantee removing the MFAT high.

Appendix G. Summary of Renibacterium salmoninarum tests from replacement female broodstock, Hayspur Hatchery, 1993.

Test method	Total number of tests	Total positives	Percent positive
MFAT	199	27	13.6
ELISA	69	18*	26.1
DFAT	69	0	0.0

*14 lows, 4 moderates

Appendix H. Comparison of ELISA (enzyme-linked immunosorbent assay) and MFAT (modified fluorescent antibody) tests to detect Renibacterium salmoninarum done on the same female Hayspur Hatchery broodstock, Hayspur Hatchery, 1993.

Total number:	69
Total BKD positives:	23 (33.3%)
Positive by ELISA:	18*(26.1%)
Positive by MFAT:	9 (13.0%)
Positive by both methods:	4 (5.8%)

*14 lows, 4 moderates

Appendix I. Results of disease tests on feral male rainbow trout captured below Hayspur Hatchery, November-December, 1993.

Spawn date	Accession number	ELISA* optical density	DFAT	Virus	Whirling disease
11/03	93-542B	0.240	neg.	neg.	neg.
		0.162	neg.	neg.	neg.
		0.162	neg.	neg.	neg.
		0.216	neg.	neg.	neg.
11/17	93-557B	0.092	neg.	neg.	neg.
		0.110	neg.	neg.	neg.
		0.077	neg.	neg.	neg.
		0.094	neg.	neg.	neg.
		0.083	neg.	neg.	neg.
11/24	93-563B	0.198	neg.	neg.	neg.
12/01	93-571B	0.136	neg.	neg.	neg.
12/15	93-596	0.441	neg.	neg.	neg.

Total ELISA positives = 8 (66.7%)
7 lows, 1 moderate

*ELISA results are considered negative at optical density $\leq$0.099, positive low at o.d. 0.100-0.249, positive moderate at o.d. 0.250-0.599, and positive high $\geq$0.600.

Appendix J. Summary report of Eagle Fish Health Laboratory results for Hayspur Hatchery (Class C), January 1 - December 31, 1993.

Brood year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
1993	Gloyd Sp.	Kamloop	93-018													RES: Eggs in iodophor
1990	Hayspur	Rainbow	93-203		-	-			-	-	-					DX: MAS, Bacteremia, Mycosis (external); Viro 0/4, Aeromonas hydrophila 1/4, Ps. vesicularis 1/4
1992	Hayspur	Rainbow	93-239						-	-	-					DX: MAS, Mycosis Trauma (bird marks); A. hydrophila 1/8, Flexibacter sp. 2/8 (low, antisera neg. for psychrophilus)
1993	Hayspur	Rainbow	93-306		-	-		+	-	-						DX: RS, Bacteremia; Viro 0/10, FA 0/10, ELISA 2/2 pools (low) A. hydrophila 2/4
1991	Gloyd Sp.	Kamloop	93-428													IX: Thymus tumors
Brood	Hayspur	Rainbow	93-512		-	-		+					-			IX: RS; Viro 0/20, DFAT 0/12, MFAT 0/20, ELISA 1/12 (low), WHD 0/10
Brood	Hayspur	Rainbow	93-542a		-	-		+								IX: BKD; Viro 0/35, DFAT 0/10, MFAT 10/35, ELISA 2/10 (2 mod)
Brood	Hayspur	Rainbow -feral	93-542b		-	-		+					-			IX: RS; Viro 0/6, DFAT 0/6, MFAT 1/2, ELISA 6/6 (low), WHD 0/6
Brood	Hayspur	Rainbow	93-557a		-	-		+					-			IX: RS; Viro 0/40 DFAT 0/12, MFAT 4/40, ELISA 1/12 (low), WHD 0/12
Brood	Hayspur	Rainbow -feral	93-557b		-	-		+					-			IX: RS; Viro 0/8, DFAT 0/8, MFAT 0/3 ELISA 4/8 (low), WHD 0/8
1987	Hayspur	Rainbow -males	93-558		-	-		+								IX: BKD; Viro 0/20, DFAT 0/20, ELISA 7/20 (5 low, 1 mod, 1 high)
1991	Hayspur	Rainbow	93-560		-	-		+								IX: RS, Tumor(Nephro-blastoma); Viro 0/62, DFAT 0/62, ELISA 1/62 low
Brood	Hayspur	Rainbow	93-563a		-	-		+								IX: RS; Viro 0/39, MFAT 4/39
Brood	Hayspur	Rainbow -feral	93-563b		-	-		+								IX: RS; Viro 0/2, DFAT 0/2, MFAT 0/1, ELISA 2/2 (low), WHD 0/2

Appendix J. Continued.

Brood year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
Brood	Hayspur	Rainbow	93-571a	-	-		+					-				IX: BKD; Viro 0/34, DFAT 0/12, MFAT 7/34, ELISA 1/12 (high), WHD 0/12
Brood	Hayspur	Rainbow -feral	93-571b	-	-		+					-				IX: RS; Viro 0/4 DFAT 0/4, MFAT 0/3, ELISA 4/4 (low), WHD 0/4
Brood	Hayspur	Rainbow	93-595	-	-		+					-				IX: BKD; Viro 0/20, DFAT 0/12, MFAT 0/20, ELISA 2/12 (1 low, 1 mod), WHD 0/12
Brood	Hayspur	Rainbow -feral	93-596	-	-		+					-				IX: BKD; Viro 0/3, DFAT 0/3, MFAT 0/2, ELISA 3/3 (2 low, 1 mod), WHD 0/3
1991	Hayspur	Rainbow	93-597	-	-		-	-	-	-						DX: BS, Bacteremia; Viro 0/4, DFAT 0/4, ELISA 0/4,Pseudomonas fluorescens 3/4, P. chlororaphus 4/4, P. cepacia 2/4, Streptococcus sp. 4/4

IHN Infectious Hematopoietic Necrosis virus
IPN Infectious Pancreatic Necrosis virus
EIBS Erythrocytic Inclusion Body Syndrome virus
BKD Bacterial Kidney Disease (Renibacterium salmoninarum)
RS Positive for Renibacterium salmoninarum but not clinical disease
FUR Bacterial Furunculosis (Aeromonas salmonicida)
ERM Enteric Redmouth Disease (Yersinia ruckeri)
CWD Coldwater Disease (Flexibacter psychrophilus)
PKD Proliferative Kidney Disease (PKX)
WHD Whirling Disease (Myxosoma cerebralis)
CSH Ceratomyxa shasta
ICH Ichthyophthirius multifilis
GBD Gas Bubble Disease
MAS Motile Aeromonad Septicemia
BS Bacterial Septicemia (Pseudomonas fluorescens)

IX Inspection (routine hatchery visit)
DX Diagnostic (sampled because of sick fish)
RES Research
DFAT Direct Fluorescent Antibody Test (kidney)
MFAT Modified Fluorescent Antibody Test (ovarian fluids)

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

HENRYS LAKE FISH HATCHERY

1993

Prepared by:

Thomas Herron, Regional Fisheries Biologist

INTRODUCTION

Henrys Lake Hatchery is a license-funded resident station located in the northern Island Park area of Fremont County in east-central Idaho. The hatchery was established in 1924 as an egg taking facility to off-set the potential loss of spawning habitat due to the construction of a dam at the lake outlet in 1922 (Idaho Department of Fish and Game 1924).

The hatchery continues to function as an egg taking station and ships eyed eggs of cutthroat trout Oncorhynchus clarki, rainbow trout Oncorhynchus mykiss x cutthroat hybrids, and brook trout Salvelinus fontinalis to statewide hatcheries. Egg production for 1993 exceeded 4.3 million eyed eggs.

The current hatchery building was completed in 1949 and remodeled in 1989. The building contains 10 double stacks of Heath incubator trays. Hatchery water is supplied via gravity flow from Sherwood Spring at 2 cfs for domestic and egg incubation use. Unused water flows into a small viewing pond, continues to Hatchery Creek and through a spawning facility, then finally to the lake through a 150-foot long fish ladder.

The hatchery is staffed with one permanent Fish Hatchery Superintendent and 11 months of allocated temporary time (8 months bio-aide and 3 months laborer).

HATCHERY IMPROVEMENTS

Hatchery improvements during 1993 include installation of a new Western Uni-mount snow plow and fiberglass cap to fit the 1991 3/4-ton GMC pickup. A utility cart was purchased for use with the lawn tractor. Permanent electrical service was installed at Staley Springs for winter aeration. Three 220-volt ground fault interrupters were installed at the fish ladder electrical outlet. Installation of the lake helixing system was completed.

Installation of the lake helixing system involved connecting 12, 2-inch high density polyethylene lines to 12 buried lines connected to shore-based blowers, placement of the 12 helixers attached to the pipe over a 50-acre array on the lake bottom, and constructing 1,500 anchor weights to hold pipe on the lake bottom.

FISH HEALTH

Disease inspection samples were taken from spawning cutthroat trout at Henrys Lake Hatchery from March 1 through May 4 (Appendix A). Included were ovarian fluid samples from female cutthroat taken on two dates when cutthroat x rainbow trout or cutthroat x Kamloop hybrids were produced. Specifically, ovarian fluids from 1,540 female cutthroat trout were tested for virus (308 five-fish pools, including those used for hybrid production). An additional 50 fish were sacrificed for ELISA, whirling disease (WHD), and Ceratomyxa shasta (CSH) tests. All fish were negative for viruses, WHD, and CSH. Renibacterium salmoninarum (RS) was detected by Fluorescent Antibody Test (FAT) in two ovarian pools at a level too numerous to count, and 16 of the 50 ELISA samples were also positive (15 lows and 1 moderate). The eggs from the high-FAT pools were discarded. Bacterial samples were taken from 22 fish. Aeromonas salminocida, the causative agent of furunculosis, was detected from 1 of the 22 fish (Appendix 1).

Similar samples were taken from spawning brook trout in October and November. A total of 295 ovarian fluid samples were tested for viruses and RS (180 DFAT and 115 modified FAT). Fifty fish, a portion of which were from the 295 fish mentioned above, were sacrificed for DFAT, ELISA, WHD and bacterial tests (additional ovarians were taken from 22 of these fish). All were negative

for viruses, bacteria, and WHD, and the 295 ovarians were negative by standard FA for RS. Five of 22 ovarians were positive for RS by MFAT and 10 of 50 ELISA samples were positive (lows).

The significance of broodstock evaluation at Henrys Lake has become evident from the furunculosis outbreak at Ashton Hatchery in September and from the finding of RS (DFAT) among the rainbow x cutthroat hybrids at Hagerman in January 1994.

Recommendations for 1994:

1. Apply stringent disinfection to eggs and equipment to prevent a recurrence of the furunculosis problem.

2. Consider implementing an aggressive sampling, isolation incubation, and culling program in order to reduce the possibility of vertical transmission of RS, or worse, the occurrence of clinical bacterial kidney disease (BKD). The primary obstacles to such a program will be limited manpower and incubation space at Henrys Lake.

FISH SPAWNING

The fish ladder was placed in operation February 23, 1992 and spawning began March 1. The 1993 run consisted of 4,432 cutthroat (7,809 in 1992) and 1,600 hybrids (2,216 in 1992), a decrease of 43% and 28%, respectively, compared to 1992 run numbers (Figures 1 and 2). Oxygen depleted to low levels in Henrys Lake during 1993 possibly effecting run numbers and timing.

Average total length of male and female cutthroat represented in the 1993 spawning run was 457 mm (Figures 3 and 4). Hybrid trout averaged 535 mm in total length (Figures 5 and 6).

Cutthroat green eggs totaled 3,869,768 from 1,295 females producing an average fecundity of 2,988. Green egg yield was 2,875,576 with an eye up survival of 74.31% (Appendix B).

A total of 1,557,427 cutthroat x rainbow green eggs were collected from 589 females for an average fecundity of 2,644 eggs per female. Eyed hybrid eggs totaled 1,121,347 with an eye-up survival of 72% (Appendix B).

Brook trout were spawned during the fall of 1993. Henrys Lake level was nearly full during early October when the ladder was opened. Morpholine was used to imprint brook trout fry planted in previous years, and a drip system was initiated into the spawning facility on October 14. Due to the success of fish ascending the fish ladder, it was unnecessary to use the trap net. A total of 926 brook trout were counted in the ladder; 413 males and 513 females (Figure 7). Temiscamie and naturalized brook trout were spawned together randomly for egg production as in 1992 and 1991 at the direction of hatchery management due to no significant difference in performance and to infuse new genetic stock into naturalized brook trout. Brook trout green eggs totaled 583,388 taken from 322 females for an average fecundity of 1,811 eggs per female using air spawning. Eyed eggs totaled 396,914 with an eye-up survival rate of 68% (Appendix C).

Male brook trout averaged 376.17 mm total length, n=342, and female brook trout averaged 402.23mm total length, n=383 (Figures 8 and 9). These averages were down 47.21 and 18.92 mm, respectively, from the previous year, however this could be a reflection of selection differences between the trap net and the fish ladder.

PUBLIC RELATIONS

Two television interviews were conducted in January with local stations regarding oxygen levels and the potential for a winter kill. One television interview was conducted on the topic of producing hybrid trout and two interviews concerned the Army Corp of Engineers' order to restore the hatchery parking lot to a rearing pond. The public became very interested in this topic, and the resulting letter writing campaigns and the flurry of letters to the editor resulted in the Corp allowing an application after the fact from the Idaho Department of Fish and Game (IDFG) for a permit for the parking lot. News letter articles were written for the Henrys Lake Foundation and a monthly article titled "Close up on Henrys Lake" was written for The Yellowstone Gateway Post. An additional television interview was conducted in June concerning the opening day of fishing season. Tours were conducted throughout the summer. Presentations were made at the Henrys Lake Foundation annual meeting and the Island Park Sportsmen's Association election meeting. The Island Park Chamber of Commerce requested a presentation on creel survey data and the potential for more restrictive regulations on Henrys Lake. A public meeting was held in Island Park to solicit public input for the upcomming regulation cycle. The interpretive display developed for the parking lot was maintained and a fish feed dispenser was installed in the parking lot with proceeds going to the Island Park Sportsmen's Association for development of interpretive displays and programs around Henrys Lake.

SPECIAL PROJECTS

A dissolved oxygen and oxygen depletion rate study was conducted during January. From data collected at various sample sites on the lake, an oxygen depletion rate was calculated in 1993 for comparison with other years. This information was used to organize equipment and personnel efficiently prior to hypoxic conditions. Aerators were installed at the mouth of Hatchery Creek, in Staley Springs Harbor, and outside the harbors at Wild Rose Ranch and Pittsburgh Creek in mid-January and they remained in service through mid-May when ice cover left the lake.

Hatchery personnel assisted the Idaho Department of Health and Welfare, Division of Environmental Quality (DEQ) and its contractors with lake and stream sampling. Hatchery personnel offered IDFG input at public meetings for the DEQ sponsored Clean Lakes Study conducted on Henrys Lake to estimate the nutrient budget for the lake.

Gillnetting was conducted by IDFG personnel the first week of June 1993. Utah chubs were found in considerable numbers on the first net night (approximately 45 of 90 fish), none the second night, and one the third night. This has resulted in great concern by Fisheries personnel and the public. Investigation into Utah chub population dynamics will continue in comming years.

Riparian fencing was completed along the cliffs area of the lake in 1993. The access road into the cliffs was also improved by grading and graveling. A cattle guard was set at the entrance to eliminate a barbed wire gate that was difficult for the public to use.

Hatchery personnel organized and facilitated installation and completion of the helixing system for Henrys Lake during July and August of 1993. Department personnel from Regions 4 and 6 were on hand, as well as reservists from Region 6, for the 10 work days it took for installation. Volunteers from the Henrys Lake Foundation were on hand for the first day and a half. The enthusiasm and help was much appreciated. The system works well and installation went without unsurmountable problems.

LITERATURE CITED

Idaho Department of Fish and Game. 1924. Fish and Game Warden. 10th Biennial Report. 10:113-114.

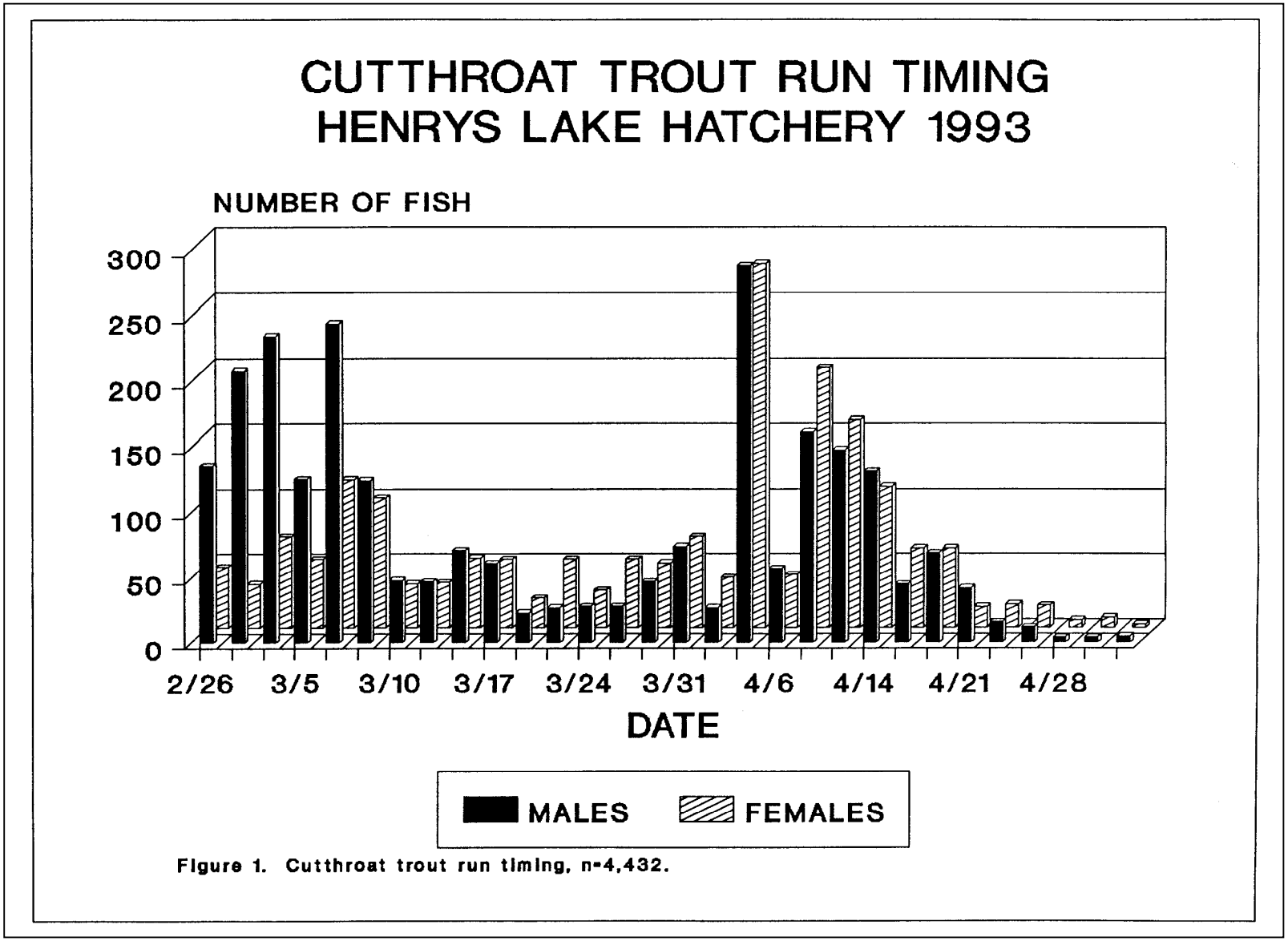

Figure 1. Cutthroat trout run timing, n=4,432.

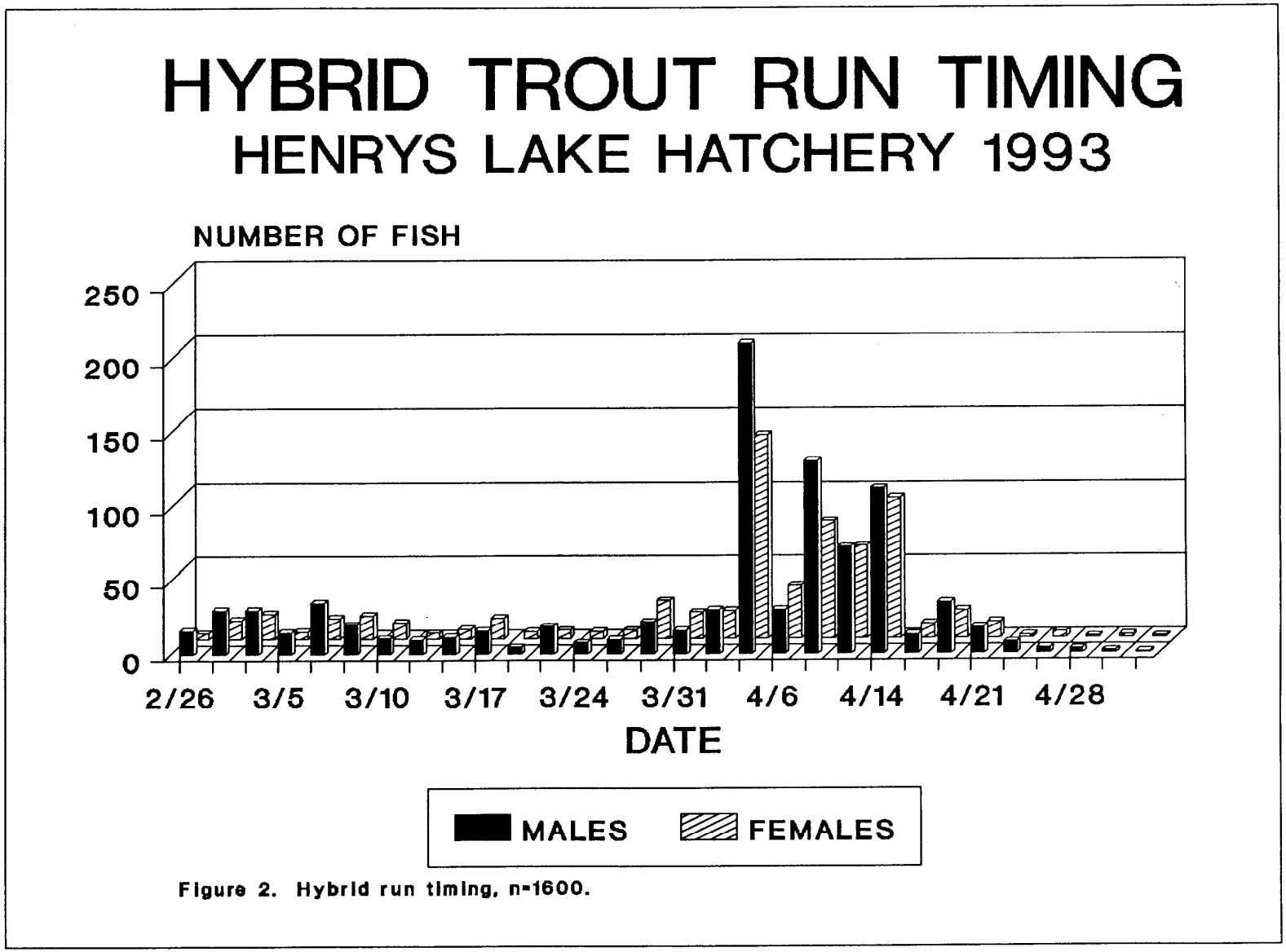

Figure 2. Hybrid run timing, n=1600.

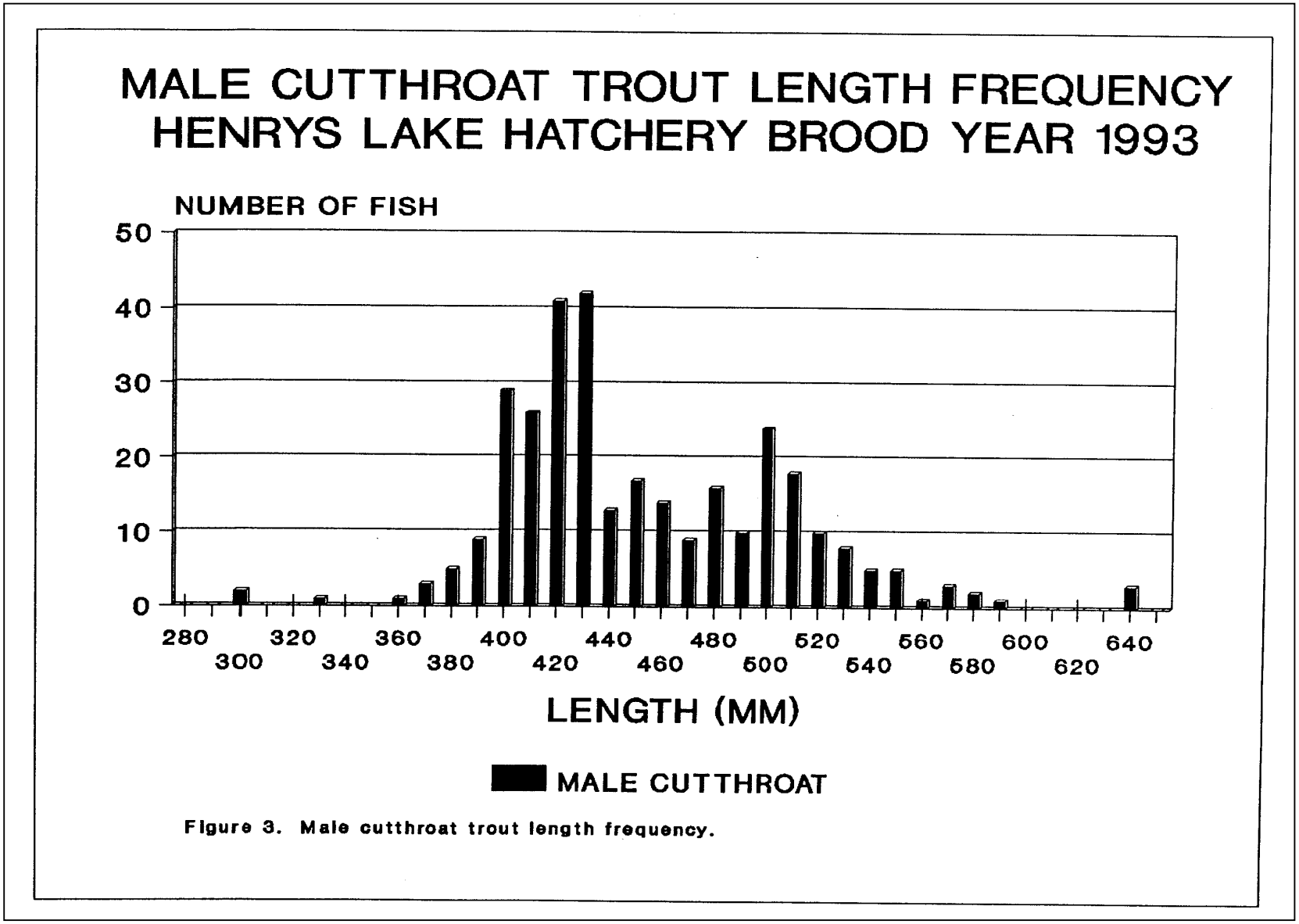

Figure 3. Male cutthroat trout length frequency.

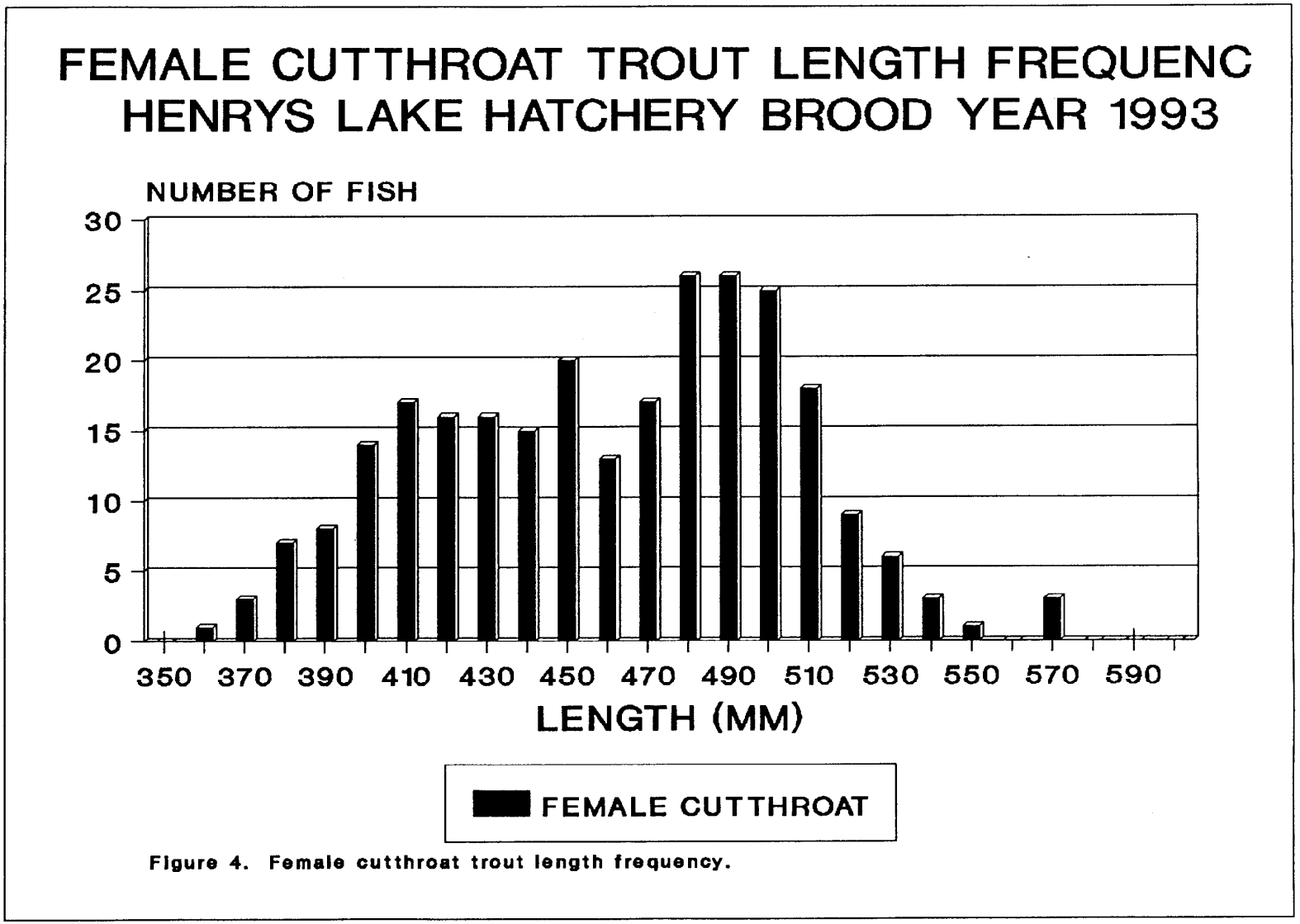

Figure 4. Female cutthroat trout length frequency.

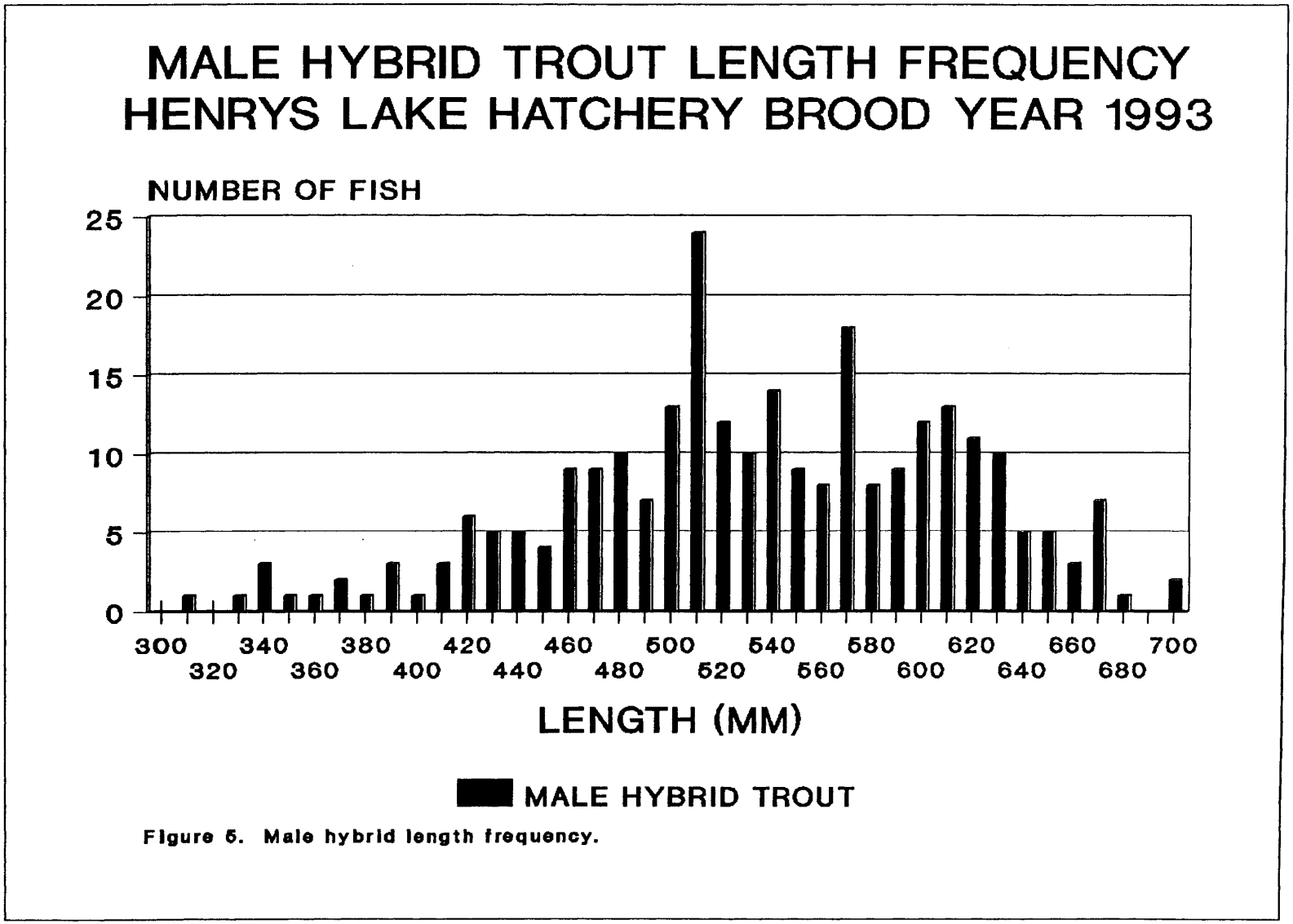

Figure 5. Male hybrid length frequency.

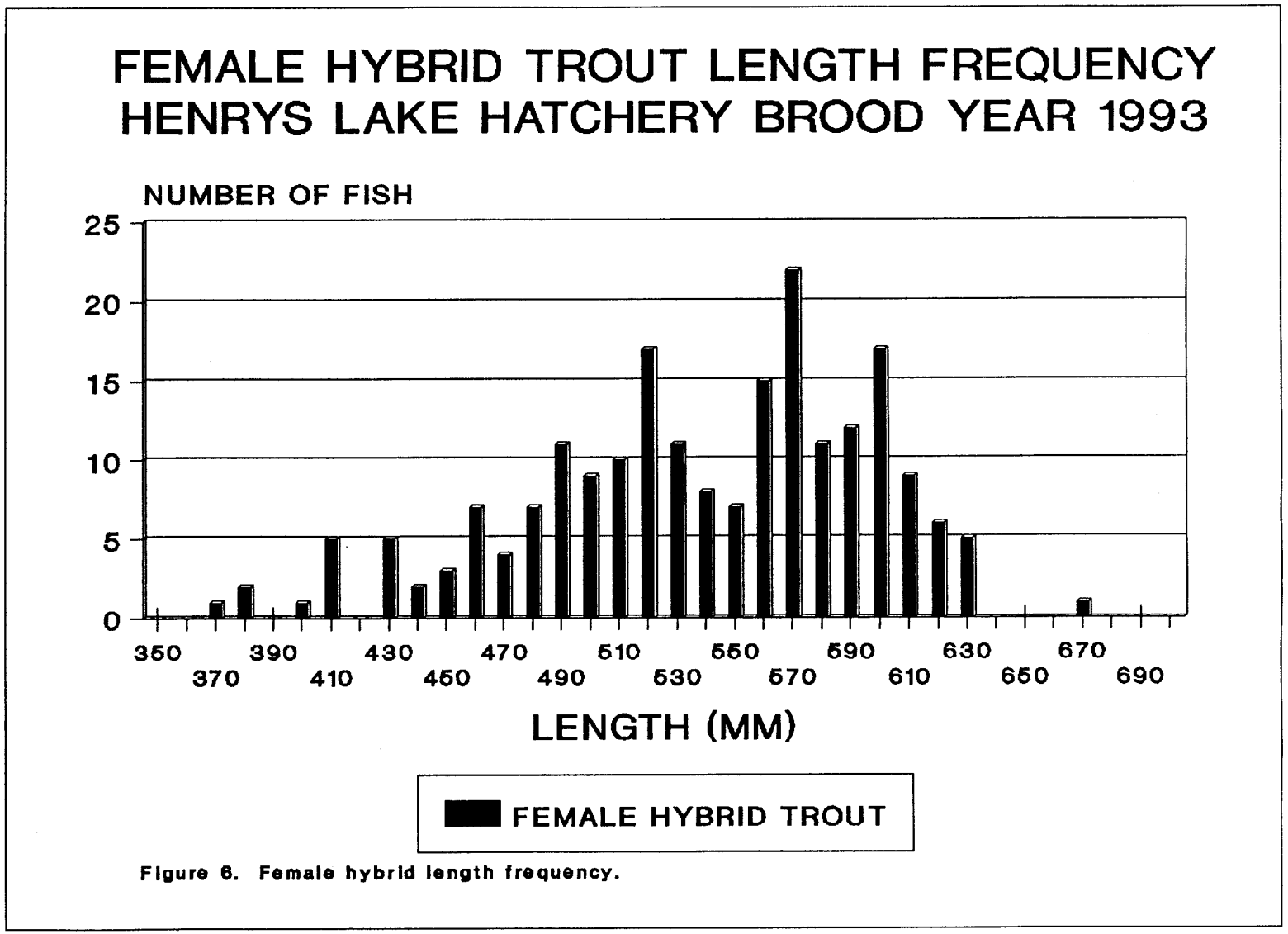

Figure 6. Female hybrid length frequency.

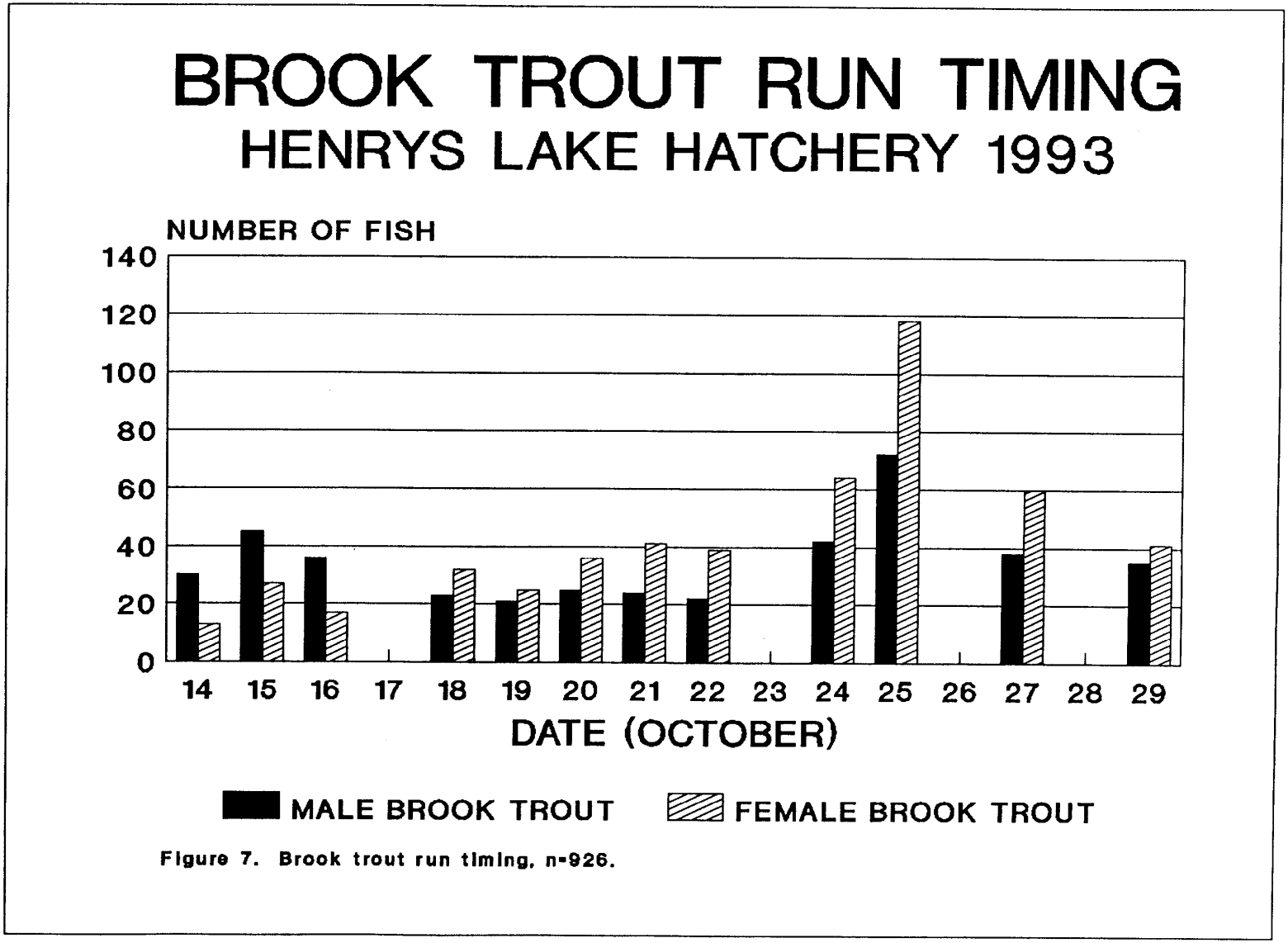

Figure 7. Brook trout run timing, n=926.

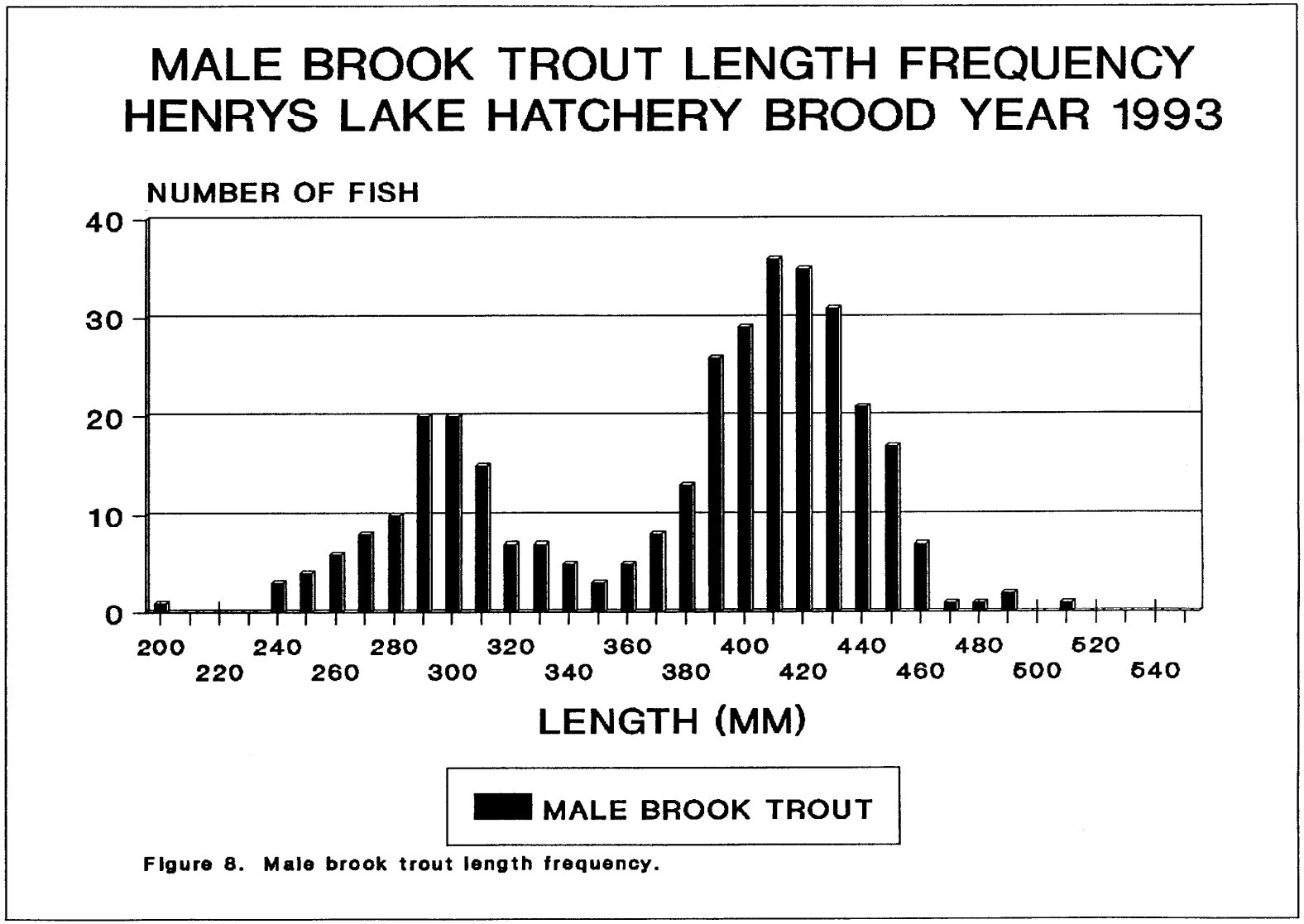

Figure 8. Male brook trout length frequency.

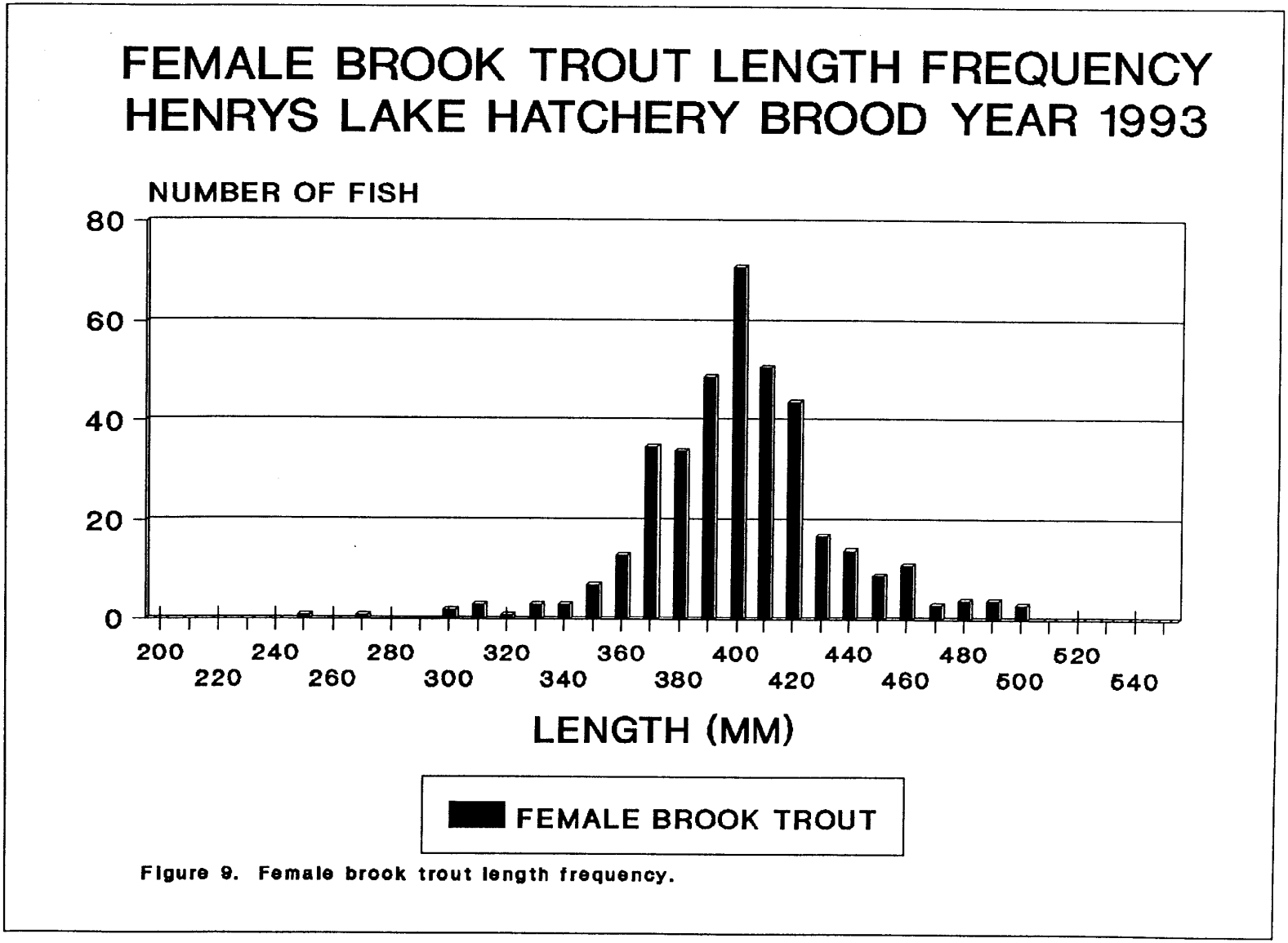

Figure 9. Female brook trout length frequency.

Appendix A. Summary report of Eagle Fish Health Laboratory results for Henrys Lake Hatchery (Class C), January 1 - December 31, 1993.

Brood year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
Brood	HL	Cutthroat[a]		93-064	-	-		-								IX: Negative for pathogens; Viro 0/45, FA 0/45
Brood	HL	Cutthroat		93-074	-	-		-								IX: Negative for pathogens; Viro 0/70, FA 0/70
Brood	HL	Cutthroat		93-083	-	-		-								IX: Negative for pathogens; Viro 0/170, FA 0/170
Brood	HL	Cutthroat		93-096	-	-		-								IX: Negative for pathogens; Viro 0/110, FA 0/110
Brood	HL	Cutthroat		93-110				+	+	-			-	-		IX: BKD, FUR; ELISA 16/50 (15 low, 1 mod), FUR 1/22, WHD 0/20, CSH 0/20
Brood	HL	Cutthroat		93-111	-	-		-								IX: Negative for pathogens; Viro 260, FA 0/260
Brood	HL	Cutthroat[b]		93-138	-	-		+								IX: RS; Viro 0/215, FA 1/43 pools
Brood	HL	Cutthroat		93-139	-	-		-								IX: Negative for pathogens; Viro 0/160, FA 0/160
Brood	HL	Cutthroat		93-164	-	-		-								IX: Negative for pathogens; Viro 0/420, FA 0/170
Brood	HL	Cutthroat		93-183	-	-		-								IX: Negative for pathogens; Viro 0/45, FA 0/45
Brood	HL	Cutthroat		93-190	-	-		+								IX: RS; Viro 0/45, FA 1/9 pools
Brood	HL	Brook trout		93-518	-	-		-								IX: Negative for pathogens; Viro 0/85, DFAT 0/19, MFAT 0/85

Appendix A. Continued.

Brood year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
Brood	HL	Brook trout	93-533	-	-			-								IX: Negative for pathogens; Viro 0/210, DFAT 0/95, MFAT 0/115
Brood	HL	Brook trout	93-541					+	-	-			-			IX: RS, Mycosis (internal); DFAT 0/50, MFAT 5/22, ELISA 11/50 (low), WHD 0/20

[a]Used to produce cutthroat x Kamloop (Ennis) hybrids
[b]Used to produce cutthroat x rainbow (Hayspur) hybrids

IHN Infectious Hematopoietic Necrosis virus
IPN Infectious Pancreatic Necrosis virus
EIBS Erythrocytic Inclusion Body Syndrome virus
BKD Bacterial Kidney Disease (Renibacterium salmoninarum)
RS Positive for Renibacterium salmoninarum but not clinical disease
FUR Bacterial Furunculosis (Aeromonas salmonicida)
ERM Enteric Redmouth Disease (Yersinia ruckeri)
CWD Coldwater Disease (Flexibacter psychrophilus)
PKD Proliferative Kidney Disease (PKX)
WHD Whirling Disease (Myxosoma cerebralis)
CSH Ceratomyxa shasta
ICH Ichthyophthirius multifilis
GBD Gas Bubble Disease
MAS Motile Aeromonad Septicemia

IX Inspection (routine hatchery visit)
DX Diagnostic (sampled because of sick fish)

Appendix B. Egg summary, Henrys Lake Hatchery, 1993.

Species	Green eggs	Eyed eggs	Percent Eye-up
Cutthroat	3,869,768	2,875,576	74.3%
Hybrid Trout	1,557,427	1,121,347	72.0%
Brook Trout	583,388	396,914	68.0%
TOTAL	6,010,583	4,393,837	73.1%

Appendix C. Eyed eggs shipped from Henrys Lake Hatchery, 1993.

Species	Eyed eggs shipped	Receiving Hatchery
Brook trout	314,700	Ashton
Brook trout	54,000	Clark Fork
Subtotal (brook)	368,700	
Hybrid trout		Mackay
Hybrid trout	366,395	Hagerman
Hybrid trout	537,195	Ashton
Hybrid trout	10,000	Grace
Hybrid trout	60,000	Sandpoint
Subtotal (hybrid)	978,590	
Cutthroat trout	1,539,619	Mackay
Cutthroat trout	35,000	Ashton
Cutthroat trout	305,000	Hagerman
Subtotal (cutthroat)	1,879,619	
TOTAL (all species)	3,226,909	

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

KOOTENAI FISH HATCHERY

1993

Prepared by:

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Paul J. Anders, Fishery Biologist

INTRODUCTION

The Kootenai Experimental White Sturgeon Aquaculture Facility is located in Boundary County, Idaho, approximately three miles west of Bonners Ferry in extreme northeast Idaho. Construction of the facility was completed in the spring of 1991 as a resident fish mitigation measure under the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program [Section 900 (g) (1) 1987 (H); Action Plan, section 1403 (7.5)]. Funding for this facility was provided by Bonneville Power Administration (BPA) under the auspices of the Northwest Power Planning and Conservation Act (P.L. 96-501, 1980).

Staffing at the facility includes an Idaho Department of Fish and Game facility manager and three permanent Kootenai Tribal personnel. This facility produces 1- and 2-year-old white sturgeon for laboratory and field research, including experimental releases into the Kootenai River. This research facility was established for experimental rearing of Kootenai River white sturgeon as part of a Bonneville Power Administration (BPA) project evaluating white sturgeon in the Kootenai River. The facility will release 1- and 2-year-old sturgeon during the spring to fall period as directed to meet research objectives. Representative numbers of fish >70 cm total length (TL) will be PIT-tagged, marked with a scute removal pattern, and fitted with radio and sonic transmitters to be tracked after release into the river during 1994.

WATER SUPPLY

The facility has two water supply systems, Kootenai River water and Bonners Ferry city water. A new double primary pump system was designed for the facility and installed during the first week of May. The intake system contains two electric 7.5-horsepower submersible pumps, each in a separate 8-inch diameter steel pipe. One pump runs for 24 hours before the system automatically switches to the second pump for 24 hours. A third pump (portable gas 8-horsepower) was also purchased for further water reliability in the event that both primary electrical pumps fail at the same time, or in case of generator failure during a power outage. This gas-powered pump can deliver up to 190 gpm depending on river elevation.

Kootenai River water is pumped into a head-box at approximately 947 l/min and is distributed for egg incubation, juvenile rearing, adult holding, and recovery of female spawners. The gravity-fed city water is first dechlorinated through two activated charcoal canisters. Then the water goes through a column packed with aeration media (shot shell wads) and then into a head-box for distribution.

The Kootenai River water temperature varies by season from a low of 1°C in the winter and as warm as 20°C in the summer. The city water temperature also varies seasonally. Following spawning in 1993, city water temperatures in the facility ranged from 13°C to 16°C (Appendix A).

An electric water heater can be used for city and river water in the winter, increasing the water temperature to 17°C in three rearing tanks. A water chiller was installed in June to chill river water. This chiller was used for incubation and early larval rearing. However, this chiller has a limited capacity: chilling 3 to 4 gpm or 2 rearing tanks using a recirculation system.

FACILITY DESIGN

The Kootenai Experimental Facility is a metal pole building, 17.8 m long and 12.5 m wide, housing rearing ponds, an office, laboratory space, and a backup diesel generator. Rearing ponds consist of two rectangular tanks 3.66 m in length by 0.36 m wide by 0.45 m high; one rectangular tank 3.66 m in length by 0.56 m wide by 0;30 m high; one rectangular tank 3.09 m in length by 0;37 m wide by 0.47 m high; ten rectangular tanks 1.20 m in length by 0;60 m wide by 0.40 m high; three rectangular tanks 1.20 m in length by 0.45 m wide by 0.57 m high; three circular tanks 3.06 m in diameter by 1.53 m high; and three circular tanks 1.53 m in diameter by 1.22 m high.

PRODUCTION

Incubation and Early Fry Rearing

On June 26 at 1700 hours, 12 hours post-fertilization, random egg samples were taken from the bottom, middle, and top of the MacDonald jars from each water source. We then recorded number of eggs sampled and their embryonic stage under a dissecting microscope (Appendices B, C, and D).

Water flow was increased 48 hours post-fertilization; to roll the eggs and reduce fungus infection and clumping. With heated city water temperatures of 18°C to 19°C, fungus clumping and most egg mortality had already occurred at this time. Ambient city water temperature was approximately 15°C, with better survival to hatch (Appendix E). Hatching began 4.5 to 5 days post-fertilization on Kootenai River water and heated city water. On city, ambient river, and chilled river water, hatching began 7 days post-fertilization and lasted up to 3 days.

The late-hatching larvae in all water sources showed a high incidence of deformity, mainly in the form of crooked backs, which rendered the post yolk sac fry unable to feed (Siple and Aitken 1991). Total hatching produced 14,217 larvae on ambient city water, heated city water produced 527 larvae, and 1,264 were produced on Kootenai River water. Chilled river water jars produced 937 larvae (Appendix F). Larvae were allowed to swim out of the MacDonald jars directly into emergence tanks or rectangular rearing tanks.

Larvae hatched in ambient city water were split, weighed, and moved to respective rectangular rearing tanks. All larvae hatched in heated and ambient city water were switched to ambient river water on July 21. Feed initiation began 10 days post-hatch.

SURVIVAL

Hatching

As in past years at the facility, a percentage of post yolk-sac larvae never did initiate feeding on processed feed. This is represented by mortality between July and August (Appendix F).

Hatching success was substantially higher for eggs collected by hand stripping (mean 30.4% hatch, range 9.2-40.8%) than for eggs collected by cesarian surgery (mean 7.1% hatch, range 3.9-11.4%) (Appendix F). the low percent hatch of eggs surgically collected may be largely explained by the following two factors:

1. Blood and white eggs (already dead) were found in the ovarian fluid at the onset of and throughout the surgical process. No blood or white eggs were seen in ovarian fluid expressed during the earlier hand stripping. Blood in the ovarian fluid may have resulted from the fish's unusual movement in the stretcher. However in past years, blood has bee observed in ovarian fluid during surgery with fish that were not previously hand stripped, and did not exhibit any motion in the stretcher.

2. Eggs collected by cesarian surgery were the last lots to be transferred into MacDonald hatching jars. Therefore, egg loss may have also been due to anoxia or clumping to a greater extent than seen with eggs to jars previously.

Fry

The largest monthly fry mortality occurred between July and August (Appendix F) when larvae must begin feeding on processed feed. In addition to egg mortality before hatching, the onset of feeding constitutes another critical period for survival.

Fingerlings

No major mortality episodes occurred with fish from the brood year 1993. However, small numbers of fingerlings routinely died throughout the 1993 rearing period beginning in early fall. The cause or causes of this chronic mortality are not understood. No evidence of bacterial gill disease or white sturgeon irridovirue (WSIV) was observed with fish from the 1993 brood year. However, measuring condition factors of dead and live fish may provide some insight into this low level chronic mortality.

BROOD YEAR 1992

In January 1993, approximately 1,600 age 1 (1992 brood year) fish were held in the facility. Due to multiple, and finally terminal, pump failure at the facility on February 18, all but 4 of these fish were moved to the Sandpoint Hatchery. On May 28, 450 of these fish were brought back to the Kootenai facility (Figure 1). Percent monthly survival of these fish ranged from 89% to 100%.

FISH HEALTH

Fish health at Kootenai Hatchery was excellent in 1993. Two minor outbreaks of bacterial gill disease occurred in the brood year 1992 fish and were controlled with salt baths at 3% concentration. No visits were made by Eagle Fish Health Laboratory pathologists in 1993, nor were any samples sent to the lab, but routine contact was maintained over the telephone.

Recommendations for 1994 include:

1. Cooperate with Eagle Fish Health Laboratory and Clear Springs Laboratory in testing fish for WSIV.

2. Notify pathologists when adult. broodstock are to be captured so that disease samples may be collected from wild populations.

FISH TRANSFERS

During the third week of February, all but 4 of the brood year 1992 fish were moved to the Sandpoint Hatchery following terminal pump failure on February 18. On May 28, 450 fish from the 1992 brood year (21 fish/lb average TL, 6.5 inches) were returned to the Kootenai Experimental Facility following proven success of the new water intake system. On December 13, 40 fish from the 1992 brood year and 199 fish from the 1993 brood year were transferred from the Kootenai Experimental White Sturgeon Facility to Sandpoint Fish Hatchery. On December 21, 1,204 brood year 1993 fish were transferred to Clear Springs research labs to investigate the effects of rearing density on the outbreak of WSIV.

BROODSTOCK CAPTURE

From April through June of 1993, 61 white sturgeon were captured from the Kootenai River by angling between Rock Creek and Ambush Rock (Appendix G). Of the 61 fish captured, only 4 (6.6%) were females (Appendix G). Captured fish were placed upside down in a stretcher suspended across the boat gunwales, with river water added as needed. Fish were then sexed in the field either by making a 1-cm abdominal incision and viewing gonadal tissue with a veterinarian otoscope or by inserting a flexible plastic tube and extracting developing oocytes (eggs) by suction. Once the sex and stage of sexual maturation were determined, fish were either brought to the facility by boat or truck or released back into the river.

Of the 61 fish captured, 16 sexually mature fish (4 females and 12 males) were transported to the facility; no more than 3 females and 6 males were held at one time in the facility during 1993. All fish captured were checked for the presence of PIT and Ploy tags. Fish captured without a PIT tag were PIT-tagged on the right lateral surface below the dorsal fin. During broodstock collection, fish captured were weighed (kg), measured (TL cm), and marked with the removal of the second left lateral acute (Appendix G).

STAGING BROODSTOCK

On June 19, 1993, eggs from three female white sturgeon held in the facility were tested for germinal vesicle breakdown (GVBD) with the following results:

Female (PIT tag #)	Control(n=10 eggs)	% GVBD (n=10 eggs
3775A	flattened GV	100
3552E	rounded GV 8 rounded 2 flattened	70
2705A	rounded GV 10 rounded 0 flattened	80

On June 25, 1993, sperm samples from 5 male white sturgeon were tested for motility with the following results:

Males PIT #	Sperm motility (min.)	Sperm sample volume (ml) 6/24	6/25
5360	no sperm visible	-	-
5079	>2 minutes	8	30
5326	>2 minutes	30	70
7856	no sperm visible	-	-
0863	no sperm visible	-	-

For a detailed description of male and female broodstock staging criteria and techniques, see Siple (1992).

SPAWNING PROCEDURES

One female white sturgeon (PIT tag 13775A) was spawned with 2 males (PIT tag 15079, 15326) in the Kootenai Experimental Facility in 1993. The female was captured on May 17 and transported to the facility where she was staged with an egg diameter of 3.2 to 3.3 mm and a GV position of stage 4. A progesterone assay was performed on the eggs on June 3, with only 60% exhibiting GVBD. On June 19, the female was staged again with more favorable results. The eggs had a diameter of 3.5 mm and the GV position was stage 5 with 100% of 10 eggs exhibiting GVBD; it appeared that this fish could be induced to ovulate.

Hormone injections to induce spawning began on June 23. The female was injected with a primary dose of 10% of a 0.1 mg/kg body weight dose of luteinizing hormone releasing hormone analogue (LHRHa) at 2000 hours. Twelve hours later, she was given a resolving dose of 908 of the 0.1 mg/kg body weight LHRHa. Prior to the induction injections, she was placed by stretcher into a 1.0 m x .67 m x 3.0 m covered fiberglass spawning tank. This spawning tank allowed the fish to be injected under water, which reduces stress and handling. This also makes for easier observation while waiting for ovulation.

Sperm from two males (PIT tags 15079, 15326) was checked for motility at 0030 hours on June 25. Thirty-eight ml of sperm was collected from male 15079 and 100 ml were collected from male 05326. A sperm sample from each male was checked by microscope for motility and time of death. Remaining sperm was placed

in ziplock plastic bags with pure oxygen and stored in a refrigerator. Care was taken to keep the tubing, syringe, and surface area of the fish dry when collecting sperm.

Ovulation was expected between 24 to 48 hours post-resolving injection on June 24. Twenty to 30 dark eggs were observed approximately 37 hours post-resolving dose injection near the bottom of the spawning tank. This was a good sign, as viable eggs stick to the bottom of the tank. We continued to observe her until 0200 hours on June 26. At this time, several hundred eggs were observed clumped and stuck to the bottom of the spawning tank.

EGG REMOVAL TECHNIQUES

Hand Stripping

On June 26 at approximately 0310 hours, egg removal began by hand stripping. The hand stripping technique involves massaging the ventral side of the fish while held ventral side up in a stretcher. Massaging the eggs out of the body cavity was done by applying pressure with the ball of the hand on the ventral midline of the fish and gently moving the hand posteriorly on the midline from approximately one foot anterior of the oviduct to the oviduct. During the first 40 minutes of hand stripping, 51,690 eggs were collected (Appendix E). However, the one female that was spawned this year had deformed ovaries, which may have contributed to the success of hand stripping. Rather than the ovaries being parallel to the, fish' a midline, the ovaries resembled a letter X, crossing the midline. Regardless of this abnormality, the success of hand stripping indicates that cesarian surgery may become an abandoned practice at the facility in the future.

Cesarian Surgery

On June 26 at 0334 hours, cesarian surgery began. In 1993, 34,620 eggs were removed by cesarian surgery (Appendix E). The ventral side was disinfected with 4% nitrofurazone. A 10-cm incision was made along the midline to expose the egg mass, then the eggs were gently removed with a disinfected plastic spoon from the body cavity. The eggs were placed into nine stainless steel bowls to await fertilization. This process took approximately 60 minutes. Three 10-g egg samples were collected and counted later to facilitate determining fecundity. The female was thoroughly disinfected with 4% nitrofurazone and the incision was closed with Ethicon's PDSII violet monofilament (polydioxanone) suture swedged to a reverse cutting CP-1 curved, surgical needle. A continuous suture of both the inside and outside body cavity wall was used. She was placed back into the holding tank at 0500 hours. After 24 hours she was checked and then transferred to the recovery tank.

Egg fertilization and processing began at 0500 hours. The coelomic fluid was removed from the eggs. A 10-m1 sperm sample was poured into a bowl of 2,000 ml of water. This mixture was then stirred and added to the eggs and gently stirred with feathers until the eggs began to stick to the feathers; approximately 2 minutes later. This process was performed with sperm from each male and for each of the three water experiments, for a total of nine samples which were kept separate. The bowls were drained off and a de-adhesive solution of Fullers Earth (diatomaceous earth) mixed with water, and set in flowing water for tempering, was then added to the eggs. Again eggs were gently stirred until they were no longer adhesive. Constant monitoring of the egg temperature was done so when the egg mixture increased more than 5°C, it was poured off and new

tempered mix was added. This process lasted 75 minutes. The eggs were thoroughly rinsed to remove excess material and placed into 24 MacDonald jars; 18 on ambient city water, 2 on heated city water, 2 on ambient river water, and 2 on chilled river water.

Egg densities per MacDonald jar were established as follows:

Jar number	Number of eggs per jar	Total number of eggs
1-12	2,865	34,380
13-16	2,925	11,716
17-22	5,730	34,380
23,24	2,925	5,850
	Total egg take	86,326

The flow was set at 3.79 1/min/jar. This flow rate kept the eggs suspended but not rolling. The difference between the initial and subsequent egg take estimates (0.06$) was caused by error inherent to extrapolating egg numbers from volumetric measurements.

NEW CONSTRUCTION

During fiscal year 1993, the following improvements were made at the Kootenai Facility:

1) The entire fish rearing area was insulated.
2) Wood heat was installed in the fish rearing area.
3) Water heater/chiller unit was purchased and installed.
4) Self contained on-site living facility (29-ft travel trailer).
5) Small portable transport/holding tank was purchased.
6) A heatr and insulation was installed in the water intake pump house.

PUBLIC RELATIONS

More than 500 people visited the Kootenai Experimental Facility during 1993. Approximately 90 groups of people toured the facility during 1993. These groups, usually numbering 1 to 5 people, visited the facility from Idaho, Montana, Washington, Oregon, Alaska, South Dakota, Iowa, Pennsylvania, Massachusetts, Florida, and British Columbia, Canada. Approximately 10 additional groups visited the facility from schools in Idaho and Montana communities.

RECOMMENDATIONS

Research

1. Increase capacity to control water temperatures in the facility to improve survival at critical life stages.

2. Incubate, hatch, and rear eggs, larvae, and fingerlings on ambient river water to assess potential survival of naturally-produced early life stages of white sturgeon in the river. Additional eggs, larvae and juveniles will be reared in thermally altered river water.

3. Further refine hand stripping techniques using females with normally developed ovaries.

4. Investigate the feasibility of discontinuing cesarian surgery for egg collection in favor of hand stripping.

5. Except for during major fish lose episodes, document the condition factors of live and dead fish in the facility to better understand the chronic low mortality seen at the facility.

6.

Production

Broodstock:

1. Broodstock collected should be transported to the facility as soon as possible to reduce stress.
2. Fish should be checked regularly to determine degree of maturation.
3. At least three females should be at the facility one month prior to spawning.
4. One spawning female should be old enough to have spawned naturally at least once.

Spawning:

1. Have a male to female ratio of 3:1.
2. Keep fish sorted by the male's number from incubation through stocking or until overcrowding becomes a problem.
3. Transfer a portion of larvae and fingerlings to Sandpoint Fish Hatchery to hatch and rear on heated spring water not to exceed 10°C.
4. Attempt to spawn a female 142-172 cm TL and one >213 cm TL to compare containment levels in eggs from each fish.

Incubation:

1. Do not use water warmer than 16°C for incubation for best survival.
2. Continue to incubate on ambient temperature Kootenai River water, replicate the natural environment temperature.

Facility Design

Due to the following pump and power failures at the Facility during 1993, a facility site with thermally correct reliable gravity flow water source would be beneficial.

Date	Power failure	Pump failure
1/4		X
2/11		X
2/12		X
2/17		X (terminal failure)
2/18		
8/1	X	
8/12	X	
8/29	X	
10/20	X	
12/16	X	
12/17	X	
12/29	X	
Total	7	4

ACKNOWLEDGMENTS

During 1993, the Kootenai Experimental White Sturgeon Facility crew included John Siple, Dixie Abraham, Robert Aitken, Gary Aitken, Larry Aitken, Ron Tenas, and Gwen Alley. Facility personnel wish to thank all the volunteers, too numerous to mention, who willingly donated time and resources to all phases of experimental culture of white sturgeon in the field and at our facility.

The Kootenai Tribe Fisheries Program also thanks the Bonneville Power Administration for funding this research and facility.

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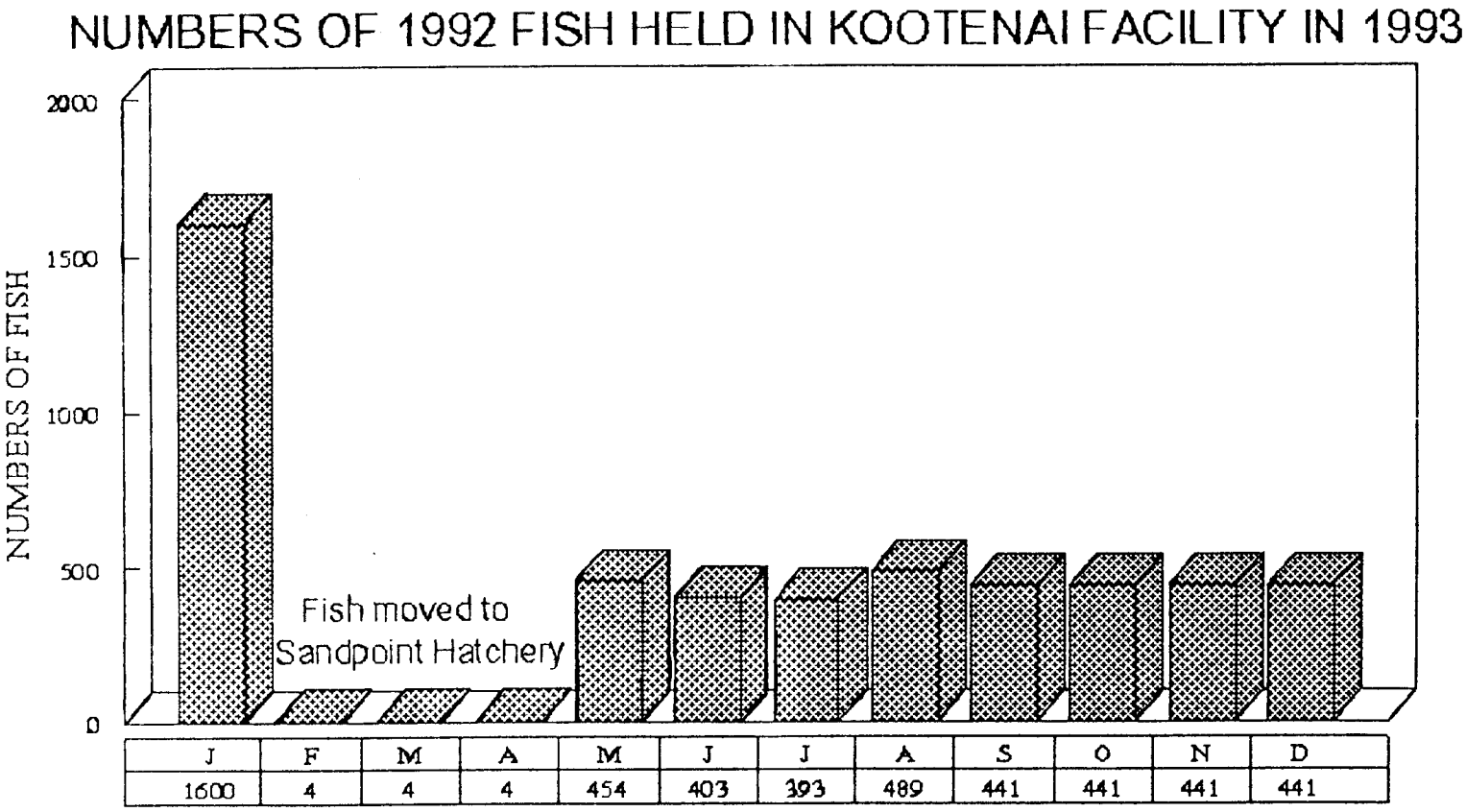

Figure 1. White sturgeon from the 1992 brood year held in the facility during 1993.

Appendix A. Daily water temperatures of all water sources in the Kootenai Experimental Facility for the 1993 brood year fish. Two temperature values for each date represent temperature at 8 AM and 4 PM. All temperatures are degrees Celcius.

DATE	HEATED CITY	AMBIENT CITY	RIVER	CHILLED RIVER
06-26-93*	18	15	15	15
06-27-93	18	15	14	15
06-28-93	18.5	15	14	15
06-29-93	19	14	15	14
06-30-93	18/18	14/14	14/13	14/14

*spawned fish

DATE	HEATED CITY	AMBIENT CITY	RIVER	CHILLED RIVER
07-01-93	18	14	14	13/13
07-02-93	19/19	13/13	15/14	14/14
07-03-93	18/18	14/14	14/15	14/14
07-04-93	18/19	14/14	15/16	14/15
07-05-93	18/20	13/14	15/16	14/15
07-06-93	18/19	14/15	15/16	14/14
07-07-93	19/19	14/15	15/16	14/14
07-08-93	19/19	14/15	14/16	14/14
07-09-93	19/19	14/15	14/16	14/14
07-10-93	19/19	14/15	14/16	14/14
07-11-93	18/19	14/15	16/17	14/15
07-12-93	18/19	14/14	15/15	14/14
07-13-93	17/18	14/15	14/16	14/14
07-14-93	18/19	14/15	14/16	14/15
07-15-93	18/19	14/15	14/16	14/15
07-16-93	18/19	14/15	14/16	14/15
07-17-93	18/18	14/14	15/15	14/14
07-18-93	18/19	14/15	14/16	14/14
07-19-93	18/18	14/15	14/15	14/14
07-20-93	18/19	14/16	15/15	14/15
07-21-93	18/19	a	15/15	14/15
07-22-93	19/19		16/15	14/15
07-23-93	19/19		16/15	14/15
07-24-93	19/19		16/15	14/15
07-25-93	19/19		16/16	14/14
07-26-93	20/20		16/16	14/15
07-27-93	19		16	14
07-28-93	19/20		16/17	15/16
07-29-93	19/20		17/17	15/16
07-30-93	19/20		17/17	15/16
07-31-93	19/20		17/17	15/16

a=All tanks using ambient city water were switched over to river water on 7/21.

Appendix A. Continued.

DATE	HEATED CITY	AMBIENT CITY	RIVER	CHILLED RIVER
08-01-93	19/20		17/17	15/16
08-02-93	19/20		17	15/16
08-03-93	19/20		16/17	15/16
08-04-93	19/20		16/17	15/16
08-05-93	19/20		17/18	15/16
08-06-93	19/20		17/18	16/16
08-07-93	19/20		17/18	16/16
08-08-93	19/20		17/18	17/16
08-09-93	19/20		18/18	14/17
08-10-93	19/19		17/18	14/17
08-11-93	19		17/18	14
08-12-93	19/21		17/18	14/16.5
08-13-93	18/18		17/19	15/16
08-14-93	16/18		17/19	14/16
08-15-93	17/18		17/19	15/16
08-16-93	20/19		17/17	15/15
08-17-93	20/21		16/16	14/14
08-18-93	21		15	14
08-19-93	19/18		16/17	14/16
08-20-93	17/18		18/18	14/16
08-21-93	18/18		17/17	14/15
08-22-93	17/18		16/16	14/15
08-23-93	18/19		14/14	14/14
08-24-93	18/18		13/14	13/14
08-25-93				
08-26-93				
08-27-93	18		15	14/14
08-28-93	20/19		13/14	19/15
08-29-93	18/18		13/14	14/14
08-30-93	18/19		13/14	13/14
08-31-93	19/19		13/14	13/14

DATE	HEATED CITY	AMBIENT CITY	RIVER	CHILLED RIVER
09-01-93				
09-02-93				
09-03-93				
09-04-93				
09-05-93	18/19		15/16	15/15
09-06-93	18/19		15/16	14/14
09-07-93	19/19		15/16	15/14
09-08-93	18/19		15/16	14/14
09-09-93	18/19		14/16	14/14
09-10-93	18/20		14/15	13/14
09-11-93	19/18		14/14	14/14
09-12-93	18/19		13/13	14/14
09-13-93	18/19		13/14	14/14
09-14-93	18/19		13/17	14/15
09-15-93	18/19		13/13	14/15
09-16-93	19/19		12/13	14/15
09-17-93	18/19		13/14	14/15

Appendix A. Continued.

DATE	HEATED CITY	AMBIENT CITY	RIVER	CHILLED RIVER
09-18-93	18/19		13/14	14/15
09-19-93	19/19		13/13	14/14
09-20-93	19/19		13/13	14/14
09-21-93	19		13	14
09-22-93				
09-23-93	20/20		12/13	14/14
09-24-93	20/20		13/13	14/14
09-25-93	14/21		12/13	13/14
09-26-93	21/21		12/13	13/14
09-27-93	20/21		13/13	14/14
09-28-93	21/21		13/13	14/14
09-29-93	20/21		13/14	14/14
09-30-93	21/21		13/14	14/14

DATE	HEATED CITY	AMBIENT CITY	RIVER	CHILLED RIVER
10-01-93	19		13	14
10-02-93	18			14
10-03-93	18/19		13/13	14/14
10-04-93	19		13	14/14
10-05-93	18/19		13/14	14/14
10-06-93	18/19		13/13	14/14
10-07-93	18/18		13	13
10-08-93				
10-09-93	17/18		11/13	11/14
10-10-93	18/19		12/12	12/14
10-11-93	17/18		11/12	12/13
10-12-93	18/18		12/12	13/14
10-13-93	17/18		12/12	14/14
10-14-93	17/18		12/12	14/14
10-15-93	17/18		12/12	14/14
10-16-93	17/17		12/12	12/13
10-17-93	17/17		12/12	12/14
10-18-93	17/17		12/12	13/13
10-19-93	17/13		11/12	12/13
10-20-93	14		12/11	12/12
10-21-93	15/16		11/12	11/12
10-22-93	15/16		11/11	12/13
10-23-93	17/17		11/12	12/13
10-24-93	16/16		11/12	11/13
10-25-93	16/16		11/12	11/12
10-26-93	14/13		12/12	12/13
10-27-93	13/13		11/12	12/13
10-28-93	12/12		12/12	12/13
10-29-93	11/11		12/12	12/13
10-30-93	heated		12/12	11/11
10-31-93	water turned off		11/11	12/12

Appendix A. Continued.

DATE	CHILLED RIVER	RIVER
11-1	11	12
11-2	11	12
11-3	11	12
11-4	10	11
11-5	10	11
11-6	10	11
11-7	10	11
11-8	9	10
11-9	9	10
11-10	9	10
11-11		
11-12	9	10
11-13		
11-14		
11-15	10	10
11-16	10	10
11-17	10	10
11-18	10	10
11-19	9	9
11-20	9	9
11-21	9	9
11-22	9	9
11-23	9	9
11-24	9	8
11-25	8	8
11-26	8	8
11-27	8	8
11-28	8	8
11-29	9	9
11-30		

DATE	CHILLED RIVER	RIVER
12-1		
12-2		
12-3		
12-4		
12-5		
12-6		
12-7		
12-8	8	9
12-9	9	9
12-10	9	9
12-11	7	7
12-12	9	9
12-13	8	8
12-14	8 .	8
12-15	8	8
12-16	8	8
12-17	8	8

Appendix A. Continued.

DATE	CHILLED RIVER	RIVER
12-18	8	8
12-19	8	8
12-20	8	8
12-21	8	8
12-22	8	8
12-23	8	8
12-24	7	8
12-25	7	7
12-26	7	7
12-27	7	7
12-28	7	7
12-29	7	7
12-30	7	8
12-31	8	8

Appendix B. Embryonic development of white sturgeon eggs hatched on heated city water at the Kootenai Experimental Facility, 12-120 hours post-fertilization.

WHITE STURGEON EMBRYONIC STAGES (heated city water)

HOURS	JAR #	EGGS	EARLY CLEAVAGE	ADVANCED CLEAVAGE	LATE CLEAVAGE	EARLY GASTRULATION	GASTRULATION	YOLK PLUG	EARLY NEURALATION	NEURAL TUBE	LATE NEURALATION	# DEAD
12	13	33	3	1	16							13
25	14	37				21	15					1
50	13	68						4	54			10
74	14	41									28	13
98	13	73									50	23
120	NO COUNT: STARTED HATCHING BETWEEN 1700 HOURS AND 2000 HOURS											

Appendix C. Embryonic development of white sturgeon eggs hatched on city water at the Kootenai Experimental Facility, 12-120 hour post-fertiilization.

WHITE STURGEON EMBRYONIC STAGES (city water)

HOURS	JAR #	# EGGS	EARLY CLEAVAGE	ADVANCED CLEAVAGE	LATE CLEAVAGE	EARLY GASTRULATION	GASTRULATION	YOLK PLUG	EARLY NEURALATION	NEURAL TUBE	LATE NEURALATION	# DEAD
12	1	41	17	18								6
12	7	31	29	1								1
25	18	42			25	17						0
25	21	33			18	15						
50	2	47						early 25				22
50	6	49						Early 2				47
74	19	34							28			6
74	22	52							5			47
74	3	30							13			17
74	9	105							7			98
98	4	33									17	16
98	10	66									6	60
98	17	42									18	24
98	20	34									5	29
120	2	71									45	26
120	11	31									1	30
120	18	50									25	25
120	21	43									3	40

Appendix D. Embryonic development of white sturgeon eggs hatched on river and chilled river water at the Kootenai Experimental Facility, 12-120 hours post-fertilization

WHITE STURGEON EMBRYONIC STAGES (city water)

HOURS	JAR #	# EGGS	EARLY CLEAVAGE	ADVANCED CLEAVAGE	LATE CLEAVAGE	EARLY GASTRULATION	GASTRULATION	YOLK PLUG	EARLY NEURALATION	NEURAL TUBE	LATE NEURALATION	# DEAD
						River water						
12	15	40	10	6	17							7
25	16	31			25	6						0
50	15	52				17		6	25			21
74	16	33				15				23		10
98	15	44									20	24
122	16	62						early 2			31	31
						Chilled river water						
12	23	35	15	15								5
25	24	43				18	15					10
50	23	83						(early) 33				50
74	24	42							11			31
98	23	76									36	40
122	44										17	27

Appendix E. Hatching success of hand stripped and surgically removed white sturgeon eggs at the Kootenai Hatchery, 1993.

Tank No.	No. of eggs before hatch	Number hatched	Percent hatched
	Hand stripped eggs		
1	5,730	2,154	38.6
2	5,730	1,778	31.0
3	5,730	2,166	37.8
7	5,730	1,264	.22.1
8	5,730	527	9.2
9	5,730	2,336	40.8
10	5,730	2,224	38.8
11	5,730	2,339	40.8
15	5,850	937	16.0
Total	51,690	15,725	30.4%
	Surgically removed eggs		
4	5,730	214	7.5
5	5,730	326	11.4
6	5,730	219	7.7
12	5,730	179	6.3
13	5,850	167	5.7
14	5,850	115	3.9
Total	34,620	1,220	7.1*

* See text for explanation of low percent hatch.

Appendix F. Hatch and survival data for 1993 broodyear in the Kootenai Experimental Facility. Tank numbers 15-18 did not receive fish until August or September.

	Water source	Tank number		Number hatched	Number of fish surviving*					
					July	Aug	Sept	Oct	Nov	Dec
1	city	1	H	2,154	1,635	136	43	38	200	187
2	"	2	H	1,778	1,267	283	85	80	59	56
3	"	3	N	2,166	1,697	821	713	708	693	688
4	"	4	C	214	120	75	24	23	441	419
5	"	5	C	326	127	88	21	14	418	415
6	"	6	C	219	189	111	83	78	59	42
7	"	9	N	2,336	1,886	1,072	941	207	37	36
	"	10	H	2,224	1,916	1,186	1,072	475	22	20
8	"	11	H	2,339	1,928	1,219	1,145	436	13	4
9	"	12	C	179	146	100	93	90	87	82
10	"	13	C	167	151	78	42	37	31	27
11		14	C	115	108	59	41	37	32	27
12	chilled	15	N	937	767	665	301	266	211	198
13	river heated city	8	H	527	502	431	177	30	17	8
14	river	7	N	1,264	487	230	78	38	36	35
15	"	16	H				301	293	245	230
16	"	17	N			1,061	923	917	907	905
17	"	18	N			97	75	68	67	66
18	"	19	N				375	374	372	372

*=Increases and large decreases in number of fish surviving in a given tank is due to fish transfers among tanks to maintain optimum rearing densities.

N=eggs collected by hand stripping
C=eggs collected by cesarian surgery

Appendix G. Catch data for adult white sturgeon captured in the Kootenai River during 1993.

1993 BROODSTOCK
KOOTENAI TRIBAL EXPERIMENTAL HATCHERY

DATE	SEX	LOCATION	TIME	WEIGHT	LENGTH	DEPTH	PIT TAG #	FLOY TAG #
05-10-93	UN	ROCK CREEK	1245	----	142 CM	32 FEET	7F7F43572C	
05-10-93	UN	ROCK CREEK	1450	---	229 CM	32 FEET	7F7F44524b	
05-11-93	M	ROCK CREEK	1250	14.0 KG	136 CM	35 FEET	7F7F427F2a	
05-11-93	M	SHORTY'S ISLAND	1640	17.0-24 KG	145 CM	35 FEET	7F7F426A34	
05-13-93	M	SHORTY'S ISLAND	1140	53.0 KG	183 CM	-----	7F7F443223	
05-13-93	M	-----	-----	19.0 KG	155 CM	----	----------	00737
05-13-93	FE	SHORTY'S ISLAND	1900	51.0 KG	220 CM	36 FEET	7F7F43552E	-
05-13-93	M	SHORTY'S ISLAND	1400	---	136 CM	36 FEET	7F7F427A4D	-------
05-14-93	M	SHORTY'S ISLAND	1221	---	-----	36 FEET	UNREADABLE	555 (SONIC)
05-15-93	M	SHORTY'S ISLAND	1456	15.0 KG	146 CM	36 FEET	7F7F117F46	01554
05-15-93	M	SHORTY'S ISLAND	1545	28.0 KG	167 CM	35 FEET	7F7F457949	
05-15-93	M	SHORTY'S ISLAND	1737	15.0 KG	140 CM	35 FEET	7F7F426B49	
05-16-93	UN	SHORTY'S ISLAND	1719	11.4 KG	126 CM	31 FEET	7F7F427123	-------
05-16-93	UN	SHORTY'S ISLAND	1735.	11.0 KG	132 CM	31 FEET	7F7F444420	01053
05-16-93	M	-----	----	17.0 KG	149 CM	---	7F7F12181F	-----
05-16-93	M	SHORTY'S ISLAND	1751	21.0 KG	157 CM	31 FEET	7F7F644338	-----
05-17-93	M	SHORTY'S ISLAND	1000	21.0 KG	159 CM	33 FEET	7F7F12113P	01596
05-17-93	M	CAUGHT ON 5-15-93	1424	---	----	-----	7F7F117F46	----
05-17-93	UN	-------	1119	----	----	-----	----	-------
05-17-93	M	SHORTY'S ISLAND	1600	18.0 KG	155 CM	31 FEET	7F7F426012	
05-17-93	FE	SHORTY'S ISLAND	1700	70.0 KG	214 CM	31 FEET	7F7F43775A	-----
05-17-93	UN	SHORTY'S ISLAND	1500	36.0 KG	192 CM	31 FEET	7F7F426826	
05-16-93	M	CAUGHT ON 5-15-93		15.0 KG	146 CM		7F7F117F46	01554
05-13-93	M	SHORTY'S ISLAND	1004	45.0 KG	191 Cm	---	7F7E365326	
05-13-93	M	SHORTY'S ISLAND	1740	33.5 KG	172 CM	-----	7F7F441E79	
05-16-93	UN	SHORTY'S ISLAND	1010	-9 KG	130 CM	-----	7F7F402F5B	
05-16-93	M	SHORTY'S ISLAND	1130	53.0 KG	210 CM	36 FEET	7F7F425F1F	
05-18-93	FE	SHORTY'S ISLAND	1210	53.0 KG	199 CM	31 FEET	7F7F427916	RELEASED 5-28-93

Appendix G. Continued.

DATE	SEX	LOCATION	TIME	WEIGHT	LENGTH	DEPTH	PIT TAG #	FLOY TAG #
05-22-93	FE	UPPER SHORTY'S	1149	26.0 KG	170 CM	40 FEET	7F7F42705A	-----
05-22-93	UN	SHORTY'S ISLAND	1123	7.0 KG	110 CM	40 FEET	7F7E357439	-----
05-23-93	M	SHORTY'S ISLAND	1025	27.0 KG	175 CM	31 FEET	7F7F430B08	-----
05-23-93	M	SHORTY'S ISLAND	0957	30.0 KG	175 CM	31 FEET	7F7F4277DE	-----
05-23-93	M	SHORTY'S ISLAND	1630	24.0 KG	160 CM	31 FEET	7F7F44104D	-----
05-23-93	M	SHORTY'S ISLAND	1700	17.0 KG	145 CM	31 FEET	7F7F436A3E	-----
05-23-93	UN	SHORTY'S ISLAND	1645	7.5 KG	115 CM	--	7F7F431D70	-----
06-04-93	M	AMBUSH ROCK	1120	-----	172 CM	--	7F7F443F16	-----
06-04-93	M	AMBUSH ROCK	1250	---	215 CM	-----	7F7F007039	01589
06-07-93	M	AMBUSH ROCK	1430	11.0 KG	125 CM	---	7F7F437E56	MORTALITY
06-11-93	M	SHORTY'S ISLAND	1500	30.0 KG	185 CM	31 FEET	7F7FOE5942	-----
06-11-93	M	SHORTY'S ISLAND	1409	32.5 KG	177 CM	31 FEET	7F7F435360	2+---
06-14-93	M	SHORTY'S ISLAND	1150	10.5 KG	129 CM	31 FEET	7F7F43723D	-----
06-14-93	M	SHORTY'S ISLAND	1231	15.5 KG	144 CM	31 FEET	7F7F443E36	01492
06-14-93	M	SHORTY'S ISLAND	1300	21.5 KG	238 CM	31 FEET	7F7F436A22	-----
06-14-93	M	SHORTY'S ISLAND	1430	18.5 KG	155 CM	31 FEET	7F7F427559	2+---
06-14-93	M	SHORTY'S ISLAND	1600	51.0 KG	215 CM	--	7F7F44057F	-----
06-14-93	M	SHORTY'S ISLAND	1618	-----	-----	31 FEET	7F7E357439	-----
06-14-93	M	SHORTY'S ISLAND	1631	18.5 KG	152 CM	31 FEET	7F7F3D5079	-----
06-15-93	M	SHORTY'S ISLAND	0957	38.0 KG	184 CM	31 FEET	7F7F444F54	-----
06-15-93	M	SHORTY'S ISLAND	1050	24.5 KG	169 CM	31 FEET	7F7F3D5124	-----
06-15-93	M	SHORTY'S ISLAND	1100	33.5 KG	182 CM	31 FEET	7F7F441E5E	-----
06-15-93	M	SPORTY'S ISLAND	1215	27.0 KG	169 CM	31 FEET	7F7F12170E	-----
06-15-93	M	SHORTY'S ISLAND	1220	-----	216 CM	31 FEET	7F7F43786F	-----
06-15-93	M	SHORTY'S ISLAND	1310	12.0 KG	140 CM	31 FEET	7F7F443E1A	-----
06-15-93	M	SHORTY'S ISLAND	1505	30.0 KG	166 CM	31 FEET	7F7F435103	-----
06-15-93	M	SHORTY'S ISLAND	1510	32.0 KG	181 CM	31 FEET	7F7E12052A	-----
06-15-93	M	SHORTY'S ISLAND	1605	----	-----	31 FEET	7F7F435631	-----

Appendix G. Continued.

DATE	SEX	LOCATION	TIME	WEIGHT	LENGTH	DEPTH	PIT TAG #	FLOY TAG #
05-13-93	M	SHORTY'S ISLAND	1004	45.0 KG	191 CM	-----	7F7E365326	-----
05-13-93	M	SHORTY'S ISLAND	1740	33.5 KG	172 CM	-----	7F7F441E79	-----
05-13-93	M	SHORTY'S ISLAND	1140	19.0 KG	155 CM	-----	-------	00737
06-11-93	M	SHORTY'S ISLAND	1206	22.0 KG	160 CM	31 FEET	7F7F440863	01063
06-11-93	M	SHORTY'S ISLAND	1206	----	159 CM	31 FEET	7F7F436A54	-----

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

MACKAY FISH HATCHERY

1993

Prepared by:

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Mel Hughes, Fish Culturist

INTRODUCTION

The Mackay Hatchery is a specialty fish production station, located approximately 12 miles north of the town of Mackay in Custer County, Idaho. The hatchery produces salmonids of various species and strains, from 1 to 16 inches in length, for statewide distribution. Funding for operational costs is obtained under contract from Wallop-Breaux funds.

FISH PRODUCTION

Production for 1993 was 3,966,453 fish weighing 140,323 pounds (Appendix A). The formula used for computing net production pounds is as follows:

Pounds on Hand 12/31/93
-Pounds on Hand 1/1/93
+Pounds Stocked Out
-Pounds Transferred in

=Net Poundage Produced

A total of 8,687,846 inches of fish were stocked out of the hatchery. In other words, if all of the fish stocked out of the Mackay Hatchery in 1993 were laid end to end, they would stretch for over 137 miles. Cost of fish produced averaged $1.879 per pound, $0.0521 per fish, and $.0238 per inch (Appendix B). As the report period for the Annual Report does not coincide with the fiscal year, costs are computed by the following formula:

$$\frac{\text{FY93 Budget Total + FY94 Budget Total}}{2}$$

Budget totals include personnel and operating costs, but not capital outlay.

Included in the year's production were 13 lots, comprised of 6 species and 8 different strains, as follows:

- Rainbow trout
  - Arles (Mt) (3 year classes)
  - Mt. Shasta (Ca)
- Cutthroat trout
  - Westslope (2 year classes)
  - Henrys Lake
- Brown trout
  - Saratoga (Wy) (2 year classes)
- Rainbow x Cutthroat trout hybrids
- Early kokanee salmon (2 year classes)
- Grayling

HATCHERY IMPROVEMENTS

An 8-inch valve was installed in 1992 on the cleaning drain for the large raceways to keep water out of the cleaning ditch at all times except while actually cleaning raceways. During 1993, that valve was buried to protect it from freezing. A new settling pond was dug on the State farm ground to settle

raceway cleaning waste. As the spring water collection area is beginning to clog and flood, the construction crew disturbed the area with a backhoe to clean the collection area. A new collector pipe was drilled and installed to keep the water moving. A new domestic water pump and pressure tank was installed for the buildings on the hatchery. A fin-clipping table was built for fish marking operations. Stands were built to hold the new belt feeders. Sun screens were built for calming wilder strains of fish in the large raceways. Nursery troughs were patched in the hatchery building. A new computer was purchased to allow the hatchery to use the payroll entry system. Aluminum-framed, perforated-plate fish screens for the large raceways were built. Vinyl siding was installed on residence 01. The exterior of residence #2 was washed, scraped, primed, painted, and trimmed by the hatchery crew. The interior was repainted, and new carpet and linoleum was installed. A new wood stove was installed in residence #2. The 400-gallon fish hauling tank was updated with more efficient oxygen stones and warning system. The walls of the large raceway were patched as part of the overall maintenance program.

FUTURE NEEDS

A retaining wall, or clay bed, will need to be installed between the spring and residence #1. That residence is below the level of the spring and is in constant danger of flooding. The spring cobble area will need further cleaning with a backhoe. The furnace and wood stove in residence #3 are near the end of their useful life. The siding on residence 03 is now 36 years old. It is cracking and warping, and needs to be replaced. Additional fry feeders, replacement incubators, and nursery troughs are needed for the hatchery building. The roof on the shop peels up continually. The metal sheeting, and the underlying plywood, needs to be replaced.

FISH HEALTH

Mackay Hatchery was visited by Eagle Fish Health Laboratory pathologists on 4 occasions. Groups of fish examined included the rainbow x cutthroat trout hybrids, the brown trout, and *both* the Henrys Lake and westslope cutthroat trout (Appendix C). The only pathogen detected, at ELISA low levels, was Renibacterium salmoninarum (RS) in the brown trout. The fish were small and had been fed shortly before sampling. Therefore, it is possible that these samples were contaminated by fecal material, which can cause false-positive ELISA results. No clinical signs of disease were evident.

Mackay and American Falls hatcheries are the only two facilities in the Idaho Department of Fish and Game (IDFG) system with Class A "Quarantine" classification. This can be attributed to the facility design, the clean water sources, and to the professionalism of the hatchery personnel. The benefits of Class A status to the Department include more leeway for statewide redistribution, better survival of fish after stocking, and less contribution to the transmission of pathogens /diseases to wild or native fish populations. Maintenance of this status is highly desirable for Mackay Hatchery. Therefore, more caution should be taken in importing eggs from disease-contaminated sources. of specific concern are the Deadwood early-spawning kokanee, which are known to carry RS, and the cutthroat trout from Henrys Lake, which are also known to carry RS. The programs at Mackay should be re-evaluated in this light, and changes made where only disease-free fish are hatched and reared at this facility. Birds are not a significant depredation problem like they are at other hatcheries, but the potential for disease transfer is still quite real because of the proximity of a private hatchery.

Recommendations for 1994:

1. Re-evaluate the kokanee and Henrys Lake cutthroat programs and consider rearing these fish at another station. Look for disease-free eggs to maintain Mackay's production.

2. Compare costs and effectiveness of bird screens constructed at Nampa and Hagerman hatcheries, then choose a design for Mackay. Begin construction if deemed necessary.

FISH STOCKED

Fingerling of various species and strains were stocked in 5 of the 7 regions of Idaho (Appendix A).

Catchable rainbow trout (8+ inches) were stocked in Regions 6 and 7. Sixteen thousand adipose-clipped rainbow catchables, ranging from 14 to 16 inches in length, were stocked in Ririe Reservoir. This was an experimental program designed to determine if return-to-the-creel and holdover would increase from previous years when 70,000, 8+ inch fish were stocked from another hatchery. Creel checks indicated nearly all rainbow trout caught were the larger Mackay fish.

EGGS SHIPPED

Early kokanee, received as green eggs from the Deadwood Reservoir trap, performed much better in 1993 than they did in 1992. Eye-up exceeded 90%, which resulted in a surplus of eggs. Therefore, 250,000 eyed kokanee eggs were shipped to the cabinet Gorge Hatchery. Hagerman Hatchery received 150,000 eyed rainbow x cutthroat hybrid eggs.

FISH SPAWNING

The run of October kokanee in Paulina Lake, Oregon was much later than normal, and numbers were down significantly from.past years. As a result, no eggs were received from that source this year.

FISH FEED

Fish feed totaling 112,131 pounds was used during the year at a cost of $36,709.42. Feed conversion averaged 1.02 pounds of feed per pound of fish produced. Feed cost per pound of fish produced was $0.3338. Feed cost per inch planted was $0.0042

Biodiet, Biodry 1000, Biodry Trout, Rangen Soft-moist diet, and Nelson's Sterling Silver Cup Trout and Salmon diets were used, depending on the different nutritional needs of the different strains reared.

PUBLIC RELATIONS

Approximately 800 people toured the hatchery during the year. Due to the remote location and unfavorable climate of the hatchery, few people actually seek it out. Most are hunters and fishermen who happen here incidental to other activities.

Hatchery tours were given to 2 school groups, and a fish identification class was given to a Mackay High School class. The hatchery crew and the local Conservation officers participate in Idaho's "Adopt-A-Highway." litter control program. Six miles of Highway 93 along Mackay Reservoir are cleaned twice yearly.

FISH FIN CONDITION

Using the "Ashton Method" for measuring fin condition of catchable rainbow, rainbow x cutthroat hybrids, and Henrys Lake cutthroat, measurements were taken several times during the planting season. Fins measured 68% to 73% of wild fish fine for Arles rainbow catchables; 848 of wild fish fins for hybrids; and 74% of wild fish fine for Henrys Lake cutthroat.

FISH MARKING

Catchable rainbow stocked in Ririe Reservoir were adipose fin-clipped to test the relative contribution of large catchables to that of smaller catchables stocked in previous years.

Early kokanee stocked in Payette Lake were adipose fin-clipped.

The 10% (100,000) of the Henrys Lake cutthroat stocked in Henrys Lake, normally adipose fin-clipped, were not marked this year due to difficulties encountered in finding a clipping crew.

PERSONNEL

During 1993, a number of personnel changes occurred at the Mackay Hatchery. Doug Engemann accepted a lateral transfer to the Pahsimeroi Hatchery as Fish Hatchery Superintendent I. Robert Hoover was promoted to Fish Hatchery Superintendent I at Mackay. Kent Bourbon accepted a lateral transfer to Mackay as Fish Culturist, but soon resigned to accept a position in Wyoming. Mel Hughes was promoted to Fish Culturist at the Mackay Hatchery and will report to work in early 1994. Linda Williams resigned as Bio-Aida and was replaced by Terry Warner. Chris Theel was hired as a 3-month Bio-Aide to fill in during the 6-month period between Engemann's departure and Bourbon's arrival.

ACKNOWLEDGMENTS

During 1993, the Mackay Hatchery crew included Bill Doerr, Fish Hatchery Superintendent II; Doug Engemann, Fish Hatchery Superintendent I; Robert Hoover, Fish Culturist and Fish Hatchery Superintendent I; Rent Bourbon, Fish Culturist; and at different times, Jason Rheinhardt, Linda Williams, Chris Theel, and Terry Warner, Biological Aides. Manpower available and expended totaled 30 permanent and 19 temporary man-months.

Appendix A. Fish production at Mackay Fish Hatchery, January.l to December 31, 1993.

Species i strain	Lot number	Source	Received as	Number/pound received or carried over (*)	Yield (number/ pound)	Destination, Comments
Rainbow RA Arlee	2-En-RA	Ennis NFH, MT	Eyed Eggs	109,800/ 29,675*	113,940/ 73,750	Regions 6 & 7, Catchables
Rainbow RA Arlee	3-En-RA	Ennis NFH, MT	Eyed Eggs	120,000/ 27*	108,200/ 36,040	1994 Catchables
Rainbow RA Arlee	4-En-RA	Ennis NFH; MT	Eyed Eggs	174,369/ eggs	135,000/ alevins	1995 Catchables
Rainbow R5 Mt. Shasta	3-U-ID-R5	McCall SFH, ID	Fry	2,500/ 4.2	2,100/ 7	High Mountain Lakes
Cutthroat C2 Westslope	2-U-Id-16	McCall SFH, ID	Fry	20,000/ 333*	20,000/ 2,150	Payette Lake Met Pen 1993
Cutthroat C2 Westslope	3-U-Id-C2	McCall SFH, ID	Fry	21,000/ 46.75	20,600/ 317	Payette Lake Net Pen 1994
Cutthroat C3 Henrys Lake	3-U-Id-C3	Henrys Lake SFH, ID	Eyed Eggs	1,489,691/ eggs	1,083,856/ 11,406	Region 6 High Mountain Lakes, Henrys Lake, Sublett
Brown BNT Plymouth Rock	2-Sr	Saratoga NFH, WY	Eyed Eggs	170,000/ 64*	160,950/ 5,550	Regions 4 & 6 Fingerling, 1993
Brown BUT Plymouth Rock	3-Sr	Saratoga NFH, WY	Eyed Eggs	147,431/ eggs	110,000/ Alevins	Regions 4 & 6 Fingerling, 1994
Rainbow x Cutthroat Hybrids RC	3-U-Id-RC	Henrys Lake SFH, ID	Eyed Eggs	339,173/ eggs	245,845/ 2,925	Regions 5 & 6 (+150,000 eyed eggs shipped)
Kokanee KE Deadwood	2-U-Id-KE	Deadwood Reservoir ID	Green Eggs	560,000/ 224*	563,025/ 7,495	Regions 3, 4, 5, & 6, 1993
Kokanee KE Deadwood	3-U-Id-KE	Deadwood Reservoir ID	Green Eggs	2,371;740/ eggs	1,400,000/ 675	1994 destinations unknown (+250,000 eyed eggs shipped)
Grayling GR Wyoming	2-U-Id-Gr	Ashton, SFH, ID	Fry	1,783/ 0.53	1,950/ 8.0	Region 7 High Mountain Lakes

*-Denotes numbers and pounds of fish carried over from previous year.

Appendix B. Costs of fish stocked, Mackay Fish Hatchery, 1993.

Size	Species and Strain	Fish stocked numbers	Fish stocked pounds	Fish stocked inches	Cost per inch	Cost per pound	Cost per fish
11- to 14-inch	Arlee rainbow trout	96,861	59,335	1,262,313	.0912	$1.91	$1.1886
14- to 16-inch	Arlee rainbow trout	17,079	14,415	249,226	.1157	2.00	1.6833
4-inch	Arise rainbow trout	200	40	800	.0488	.96	.1922
2-inch	Mt. Shasta rainbow trout	2,100	7	4,200	.0267	16.00+	.0533
3- to 4.5-inch	Saratoga brown trout	160,950	5,550	650,820	.0178	2.09	.0746
6-inch	Westslope cutthroat trout	20,000	2,150	120,000	.0344	1.92	.2064
3-inch	Henry* Lake cutthroat trout	1,083,856	11,406	3,468,339	.0063	1.91	.0201
3- to 4-inch	rainbow x cutthroat hybrids	245,845	2,925	811,289	.0068	1.90	.0226
3-inch	early kokanee salmon	563,025	7,495	2,116,748	.0069	1.96	.0261
1.1-inch	grayling	2,937	1.75	3,231	.0344	63.50+	.0380

*Includes high mountain lake stocking costs.

Appendix C. Summary report of Eagle Fish Health Laboratory results for Mackay Hatchery (Class A), January 1 – December 31, 1993.

Brood Year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
1992	Ply Rock	Brown trt	93-095	-	-		-	-	-							IX:Negative for pathogens; Viro 0/15. FA 0/20, WHD 0/25, Bacte NSG
1992	Ply Rock	Brown trt	93-189									-				IX: Negative for pathogens; WHD 0/20
1993	HL	RxC Hybrid	93-282	-	-		-	-	-	-						IX: Negative for pathogens; WHD 0/60, FA 0/20, Bacte 0/12
1992	Ply Rock	Brown trt	93-283	-	-		+	-	-		-	-				IX: RS (possible contaminate); FA 0/30, ELISA 1/5 pools low, Bacte NSG, WHD 0/20
1993	W. Slope	Cutthroat	93-448	-	-		-									IX: Negative for pathogens; Viro 0/25, FA 0/24
1993	HL	Cutthroat	93-449	-	-		-									IX: Negative for pathogens; Viro 0/60, FA 0/60

[a]Used to produce cutthroat x Kamloop (Ennis hybrids
[b]Used to produce cutthroat x rainbow (Hayspur) hybrids

IHN Infectious Hematopoietic Necrosis virus
IPN Infectious Pancreatic Necrosis virus
EIBS Erythrocytic Inclusion Body Syndrome virus
BKD Bacterial Kidney Disease (Renibacterium salmoninarum)
RS Positive for Renibacterium salmoninarum but not clinical disease
FUR Bacterial Furunculosis (Aeromonis salmonicida)
ERM Enteric Redmouth Disease (Yersinia ruckeri)
CWD Coldwater Disease (Flexibacter psychrophilus)
PKD Proliferative Kidney Disease (PKX)
WHD Whirling Disease (Myxosoma cerebralis)
CSH Ceratomyxa shasta
ICH Ichthyophthirius multifilis
GBD Gas Bubble Disease

IX Inspection (routine hatchery visit)
DX Diagnostic (sampled because of sick fish)

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

McCALL FISH HATCHERY

1993

Prepared by:

Steven T. Kammeyer, Fish Hatchery Superintendent I

INTRODUCTION

McCall Fish Hatchery is located approximately one-quarter mile downstream from on the North Fork Payette River and within the city limits of McCall. McCall Hatchery was built in 1979 by the U.S. Army Corps of Engineers under the Lower Snake River Compensation Plan (LSRCP). The anadromous funding is provided by the U.S. Fish and Wildlife Service (USFWS) and is staffed and operated by the Idaho Department of Fish and Game (IDFG). The primary objective of the hatchery is to produce one million summer chinook salmon smolts annually.

McCall Fish Hatchery is also responsible for a resident fisheries program. The major objectives are redistribution of approximately 80,000 catchable rainbow trout, production of westslope cutthroat and rainbow trout fry, operation of a fish trap at Fish Lake for the collection of westslope cutthroat trout eggs, and stocking of high mountain lakes in IDFG Regions 1, 2, and 3. Assistance is also provided to Mccall Subregional office Fisheries Management personnel on various projects.

Payette Lake is the water supply for McCall Hatchery. There is a surface intake at the Lardo Dam and also a subsurface intake approximately one-quarter mile out into the lake and 50 feet down. Limited temperature control is available from mixing water from the two intakes. A 2-foot diameter constriction in the 3-foot diameter mainline limits maximum flow capacity to 20 cubic feet per second (cfs).

Incubation consists of 26 eight-tray Heath style incubator stacks. Additional incubators can be plumbed into several of the early rearing vats if additional space is required. There are 14 early rearing vats 40 feet long and 4 feet wide. Outside rearing consists of two concrete ponds 196 ft x 40.5 ft x 3 ft and one collection basin 101 ft x 15 ft which straddles the base of the other two ponds.

Fish Lake is located approximately seven miles west of McCall. It is on Little Creek, a tributary to the Little Salmon River. The facility is equipped with two 6 ft x 22 ft holding ponds, a 4 ft x 12 ft fish trap, a fish ladder, and a velocity barrier. This trapping and spawning program begins in early April and runs through mid-May.

Funding for the resident fisheries program at McCall Hatchery is provided from license sales revenue for the period of April 1 to September 30, annually.

FISH PRODUCTION

McCall Hatchery reared westslope cutthroat trout,_Hayspur strain rainbow trout, Mt. Shasta strain rainbow trout, and grayling fry in 1993 (Appendix A). These fry were mainly used to stock high mountain lakes and a few large reservoirs. Means of stocking included backpacking, aerial plants, and truck plants. All of the fish were distributed within the six-month resident funding period.

Size is critical to the efficiency of the high mountain lake stocking program. A desirable stocking size is 800 to 1,200 fish per pound, so shipments of rainbow eggs are scheduled to match the westslope cutthroat eye-up of early June. This way all of the fish are ready to be planted at one time reducing the amount of flight time to complete all plants. Even so, Hayspur strain rainbow trout reached critical plant size sooner than the Mt. Shasta strain, so they were used on initial flights.

Westslope cutthroat trout are obtained from the naturalized broodstock spawning project at Fish Lake. These trout are used to fill requests at Deadwood Reservoir, Goose Lake, the Payette Lake net pens, and high mountain lake requests. All of these fish were planted as fry except for the designated net pen fish which were transferred to Mackay Fish Hatchery to overwinter.

This was the fourth year of net pen production in Payette Lake. The net pens project is operated by the Payette Lake net pen association, sponsored by Trout Unlimited, with technical assistance provided by McCall Hatchery. Two nets, 30 feet deep, were used again this year. No significant environmental-caused mortalities occurred. Stocking rates were set at 10,000 westslope cutthroat trout per net. One net was emptied prematurely in July due to an apparent invasion of squawfish. The remaining net was emptied on October 6. The fish were of noticeably good condition and averaged approximately 10 inches in length.

BioProducts BioDiet starter and grower diets were used exclusively for all resident species produced, excluding net pens. A total of 352 pounds of feed was fed out to produce 186.9 pounds of fish growth for a conversion of 1.88.

FISH HEALTH

The spawning westslope cutthroat trout at Fish Lake were sampled by Eagle Fish Health Laboratory pathologists on May 14 (Appendix B). These fish were negative for replicating viruses, but 26 of 30 (86.7%) were positive for Renibacterium salmoninarium (RS) by ELISA (all classified as lows). Offspring from these fish were sampled at Mackay Hatchery (Eagle Fish Health Laboratory database, Accession 93-448) and found negative for pathogens.

Recommendations for the 1994 program include:

1. Get together with Hayspur Hatchery personnel and discuss a genetic diversity maintenance plan, as well as his designs for isolation incubation.

2. Consider implementing a genetic maintenance/disease culling protocol for replacement broodstock fish going back into Fish Lake.

FISH STOCKED AND TRANSFERRED

McCall Hatchery planted 22 different lakes and rivers with catchable rainbow trout throughout the summer. These fish were produced at Nampa Hatchery and then transferred to McCall Hatchery for redistribution. The total number of catchable size trout planted decreased this year due to additional systems being managed for wild trout production (Appendix C).

A total of 154 high mountain lakes were planted this year. Of these, 143 were flown in 9 flights at a cost of $3,475, or $24.30 per lake. The remainder of these lakes were planted by alternate means, primarily by backpacking.

SPAWNTARING OPERATIONS

The Fish Lake trap operated from April 5 to May 21. A total of 913 westslope cutthroat trout were trapped; 311 males and 602 females. It was estimated that 270 fish were lost on May 11 when an unknown vandal pulled some of the pickets from the holding area allowing fish to escape.

A total of 322 westslope cutthroat trout females were spawned producing an approximate green egg take of 193,200 eggs (Appendix D). Average fecundity was 663 eggs per female. The average eye-up for these eggs was 85.3%, which resulted in approximately 182,000 eyed eggs available for hatchery programs.

Westslope cutthroat trout stocked back into Fish Lake for future broodstock have been fin-clipped since the 1986 plant. Of the 913 returning adults in 1993, only 41 fin clips (4.5%) returned to the trap. This was comparable to recent years; 5.9% in 1992 and 4.6% in 1991. This data may indicate heavier recruitment to the population from natural production than from broodstock replacement. On September 27, 4,145 ad-clipped replacement broodstock were stocked back into Fish Lake. These fish represented a random selection of all lots taken and averaged 349 fish per pound.

Appendix A. Total production at McCall Hatchery, 1993.

Species	Eggs/fish received	Fish produced	Pounds produced	Cost per pound	Cost per fish
Westslope Cutthroat	212,000	125,100	77.2	13.31	0.204
Mt. Shasta Rainbow	80,600	62,650	93.5	13.31	0.204
Hayspur Rainbow	17,000	16,750	13.6	13.31	0.204
Grayling	18,500	18,250	2.6	13.31	0.204
Westslope Cutthroat (net pens)	20,000	19,000	3,524	13.31	0.204
Total	392,300	241,600	3,710.9	$13.31	$0.204

Appendix B. Summary report of Eagle Fish Health Laboratory results for McCall Hatchery (Class C), January 1 – December 31, 1993.

Brood Year	Stock	Species	Accession	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
Brood	Westslope	Cutthroat	93-209	-	-		+					-				RS; Viro 0/30, FA 0/30, ELISA 26/30 (all low), WHD 0/20

IHN Infectious Hematopoietic Necrosis virus
IPN Infectious Pancreatic Necrosis virus
EIBS Erythrocytic Inclusion Body Syndrome virus
BKD Bacterial Kidney Disease (Renibacterium salmoninarum)
RS Positive for Renibacterium salmoninarum but not clinical disease
FUR Bacterial Furunculosis (Aeromonis salmonicida)
ERM Enteric Redmouth Disease (Yersinia ruckeri)
CWD Coldwater Disease (Flexibacter psychrophilus)
PKD Proliferative Kidney Disease (PKX)
WHD Whirling Disease (Myxosoma cerebralis)
CSH Ceratomyxa shasta
ICH Ichthyophthirius multifilis
GBD Gas Bubble Disease

IX Inspection (routine hatchery visit)
DX Diagnostic (sampled because of sick fish)

Appendix C. Fish distribution, McCall Fish Hatchery, 1993.

Species	Number transferred in	Number transferred out	Number planted out
Westslope cutthroat		25,000	96,015
Mt. Shasta Rainbow			62,650
Hayspur Rainbow			16,750
Grayling	18,500		81,250
Westslope Cutthroat (net pens)	20,000		19,000
Catchable Rainbow	61,000		60,935
Total	99,500	25,000	336,600

Appendis D. Result of Westslope Cutthroat Spawntake, Fish Lake, McCall Hatchery, 1993.

Species	Females spawned	Number green eggs	Percent eye-up	Number eyed eggs	Average fecundity
Westslope cutthroat	322	213,500	85.3	182,000	663

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

MULLAN FISH HATCHERY

1993

Prepared by:

Mary Van Broeke, Biological Aide

INTRODUCTION

The Mullan Hatchery is a resident species redistribution station located four miles east of Mullan, Idaho. The hatchery buildings and grounds are owned by the Shoshone County Sportsman Association. Maintenance of the physical plant is funded through Shoshone County. The Idaho Department of Fish and Game (IDFG) funds personnel costs, production costs, and equipment through license fee dollars. The facility operates as a satellite of the Clark Fork Hatchery with one eight-month temporary employee on station year-round.

The hatchery receives water from the South Fork of the Coeur d'Alene River and the Little North Fork of the Coeur d'Alene River. Two (6 ft x 65 ft) concrete raceways, one (12 ft x 65 ft) concrete raceway, and three (approximately 30 ft x 100 ft) dirt ponds are used to hold fish prior to stocking into the Coeur d'Alene and St. Joe river drainages. One dirt pond has been developed as a show pond complete with a visitors access deck, information board, and a feed dispenser.

The Mullan facility plays a vital role in supporting the "put-and-take" rainbow trout fishery. From this location, daily trips are made onto the Coeur d'Alene and St. Joe rivers from May to September providing the frequent stocking service needed to support such a fishery.

HATCHERY IMPROVEMENTS

The Shoshone County Sportsman Association completely replaced the stop log structure and concrete walls at the lower end of pond 1 this past year. Volunteer labor and equipment completed this project, greatly improving the fish holding capacity at the hatchery.

The Shoshone County Sportsman Association constructed a new tank hoist for the fish distribution tank. This new hoist will improve safety when only one person is removing the tank.

License fee dollars purchased a new tempering pump for the fish distribution, while the Shoshone County Sportsman Association purchased a pressure washer for the hatchery.

The crew's quarters were repaired and repainted this past year.

FISH STOCKED OR TRANSFERRED

Approximately 54,000 rainbow trout >9 inches are released in waters of the Coeur d'Alene, St. Joe, and St. Maries river drainages from May to August each year to support a put-and-take fishery. The trout are transferred at full release size from the American Falls and Hayspur hatcheries in southern Idaho to holding ponds at the Mullan Hatchery. From there, hatchery personnel load the fish into a 500-gallon pick-up truck mounted tank and delivers them to the receiving waters. The distribution schedule requires 8-to 10-hour trips 4 to 5 days each week, or 59 days on the road out of 70 available working days in the summer season. while lake stocking is usually accomplished with single large releases, river stocking is much more labor intensive. Even relatively small numbers of fish require multiple stops to effectively distribute the fish for sportsman access.

PUBLIC RELATIONS

The Mullan Hatchery is located adjacent to a popular Shoshone County "day use" park. As a direct result, the hatchery receives a much higher visitor load than would be expected from its remote location. From April to October 1993, there were an estimated 5,300 visitors, including several tour groups from local schools.

The hatchery maintains a covered visitor information center with a map of stocking areas and information about the special harvest regulations in the Coeur D'Alene River and St. Joe River drainage.

On June 12, one of the dirt rearing ponds was stocked with rainbow trout to provide fishing for Free Fishing Day. Personnel from the Panhandle Region provided training and advice to over 75 visitors that day. The evolution was particularly beneficial in providing access for persons having limited mobility.

SPECIAL PROJECTS

Personnel at the Mullan Hatchery assisted in hosting the Chrysler Corporation's Jeep Jamboree August 26-30. Attendees numbered 125, with at least 70 Jeep vehicles camped around the hatchery grounds. Participants represented 10 states and Canada. This event was an excellent opportunity to present the Department's operation and the resource to visitors from all across the continent.

During the 1993 season, volunteer Sheldon Carlton of Hagerman, Idaho assisted in hatchery operations. He resided in the crew's quarters and increased hatchery security, as well as providing visitor information and assisting rearing and stocking fish. The Hatchery Host program has been a real asset during funding restrictions. Without this additional manning, the hatchery was left unattended in the absence of the manager. During previous years, the Mullan Hatchery was vandalized and one of the residences was burglarized during occasions such as these. The 1993 season had none of these events primarily due to full time manning.

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

NAMPA FISH HATCHERY

1993

Prepared by:

Rick Alsager, Fish Hatchery Superintendent III
Dan Baker, Fish Hatchery Superintendent I
Rob Morris, Fish Culturist

INTRODUCTION

Nampa Fish Hatchery is a resident trout rearing facility located two miles south of Nampa. The water supply includes eight artesian wells with a combined flow of 18 to 40 cfs of 597 water. Built in 1975 and purchased by the Idaho Department of Fish and Game (IDFG) in 1982, fish rearing facilities consist of a hatchery/crews quarters building, with 4 upwelling incubators and 4 early rearing vats; outside rearing tanks which include 16 fry raceways; 3 fingerling/broodstock raceways and 10 production raceways. Up to 16 additional upwelling incubators can be used in the fry raceways to increase egg incubating capacity. A settling pond treats flows from the production units before discharge into Wilson Springs Ponds and Wilson Springs Drain.

FISH PRODUCTION

Nampa Hatchery produced 1,328,072 fish totalling 196,669 pounds during 1993. A total of 1,243,241 fish totalling 167,119 pounds were stocked by the hatchery crew. The remaining fish were transferred to other state hatcheries. Broodstock production is included in the total number and pounds produced. Rainbow and Kamloop trout comprised 78% of the hatchery's production. In addition, brown trout, Lahonton cutthroat trout, and westslope cutthroat trout were produced (Appendix A).

Total production, cost per fish, and cost per pound of each species/strain is listed in Appendices B, C, -D and E.

A total of 2,182,717 eggs were received during 1993 (Appendix F).

FISH TRANSFERRED

A total of 78,280 catchable rainbow/Kamloop trout, weighing 31,200 pounds, were transferred to McCall and Mullan hatcheries. In addition, 4,000 fingerling brown trout were transferred to Sandpoint Fish Hatchery. Nampa Hatchery also transferred 4,755 rainbow trout and Kamloop trout broodstock, weighing 9,425 pounds, to Hayspur Fish Hatchery. Surplus broodstock were combined with catchable size trout and stocked in the Southwest Region (Region 3) waters.

FISH TRANSPORTATION

Fish transport operators stationed at Nampa Hatchery stocked waters in every region in Idaho. They also transferred fish to and from nine different state fish hatcheries. Gary Ady made four trips to Ennis National Fish Hatchery in Montana, stocking surplus rainbow broodstock in Regions 3, 4, 5 and 6 (2,204 fish, 12,000 pounds). He also stocked rainbow fingerlings from Lyons Ferry Hatchery (217,462 fish, 9,381 pounds) into the Clearwater Region (Region 2) waters. Gary also made two trips to Oklahoma and brought back channel catfish (65,500 fish, 6,710 pounds) and largemouth bass (15,000 fish, 1,500 pounds) to Regions 1, 3, 4, 5 and 6.

BROWN TROUT

Nampa Hatchery received 9,000 brown trout eggs from Manchester State Fish Hatchery in Iowa during December 1992. Early survival rate was good, with 88.1% surviving to final plant. Brown trout fingerlings were received from Grace Fish Hatchery in March 1993. These fish came from Saratoga National Fish Hatchery stock. A total of 97,170 brown trout fingerlings were stocked between May and June in the Southwest Region. In addition, 4,000 fingerlings were transferred to Sandpoint Hatchery for stocking.

LABONTON CUTTHROAT TROUT

During the 1993 fish year, Nampa Hatchery stocked 172,875 Lahonton cutthroat trout into lakes and reservoirs located in the Southwest Region and the Upper Snake Region. All Lahonton eggs received this year came from the Omak Hatchery in Washington. Southwest Region fish were stocked as fry (Appendix B), while the Upper Snake Region's fish were stocked as fingerlings into Mud Lake and Island Park Reservoir (Appendix C).

WESTSLOPE CUTTHROAT TROUT

Transferred as fingerlings from Sandpoint Hatchery in December 1992, Nampa Hatchery reared and stocked a total of 7,725 catchable cutthroat trout in 1993. Originally destined as a National Marine Fisheries Service (NMFS) replacement for rainbow trout in Redfish Lake, these trout were later stocked in Yellowbelly Lake (2,025 fish), Payette Lake (2,850 fish), and Goose Lake (2,850 fish) in July 1993.

GERRARD KAMLOOP TROUT

Nampa Hatchery received three groups of Gerrard Kamloop fry from Cabinet Gorge and Sandpoint hatcheries in 1992. Two large groups received in August 1992 were reared as production fish and stocked or transferred as catchables in 1993 (74,917 fish). The third group was received in December 1992. This group was specially reared at low densities for Deadwood Reservoir, with 11,580 fish stocked in June 1993. In addition, 1,462 excess Gerrards were stocked in high mountain lakes in the Salmon Region (Region 7). Reared as specialty fish at low density, Gerrard Kamloops did well, but were difficult to rear under normal production.

FISH FEED

A total of 276,606 pounds of feed was purchased from Rangen's Inc. and Bioproducts and fed during 1993. The overall feed conversion was 1.4 pounds of feed fed to produce 1 pound of fish. Rangen's Inc. made up 93% of the feed purchased. A breakdown of feed use and costs is given in Appendix G.

FISH HEALTH

Pathologists for the Eagle Fish Health Laboratory visited Nampa Hatchery on five occasions in 1993. In addition, the kokanee spawned by hatchery personnel at Deadwood Reservoir were also inspected (Appendix H). Gas bubble disease was a problem in April when Total Dissolved Gases (TDG) were measured at 1071 of saturation. Installation of a new packed column seemed to solve the acute gas bubble problem. However, there were several instances when small increases in fish mortality were not explained by detected pathogens, or the pathogens found were more likely to be secondary opportunists. It is possible that undetected episodes of gas bubble disease are still occurring. The TDG measurements are now routinely at 100-1021 saturation, which is usually within the tolerance range of fish. But if the barometric pressure should suddenly fall (e.g., from a low pressure front associated with a thunder storm) the TDG could briefly exceed tolerance levels for a short period of time. This could be enough to form small gas bubbles and subsequent tissue damage.

Fall chinook eggs from Wolf Lodge Creek (Lake Pend Orielle) were brought onto Nampa Hatchery in November. Only three of the parent females were sampled for diseases (Eagle Fish Health Lab database, Accessions 93-453 and 93-467). One was found to be ELISA positive for Renibacterium salmoninarum (RS). Survival of the eggs and early fry was not good through December, possibly because of water temperatures at Nampa Hatchery is above optimum for this species. This lot of fish is of particular concern, considering the susceptibility of all chinook salmon to clinical bacterial kidney disease (BKD). These fish could very easily become a source of infection to other, more critical lots of fish on the hatchery.

The near completion of bird screening over the entire hatchery will not only reduce depredation losses, but should also reduce the transfer of pathogens on the facility. This should eventually lead to an upgrade in the hatchery's disease classification, but only if all personnel are made aware of the need for good isolation practices.

Recommendations for 1994:

1. Be more cautious in importing potentially pathogen-carrying eggs on the hatchery.

2. Purchase a Weiss saturometer and monitor TDG on a routine schedule, paying particular attention to the periods immediately following the passage of a storm front.

3. Implement a training schedule for all employees on the importance of disease isolation techniques between lots of fish and enforce these practices.

FIN EVALUATION

Nampa Hatchery personnel looked at fin conditions on a number of groups of fish in 1993. Using the "Ashton Method" as a basis, different groups of production fish fine were estimated to be from 651 to 851 of a "wild fish." Raised at equal densities, Kamloops and rainbow trout averaged 65% to 70%, with Hayspur rainbow trout at 75%. The Hayspur rainbow x Henrys Lake cutthroat averaged 80%. A group of wild Kamloops, also raised at production densities, averaged 85% but they were harder to rear to catchable size. A group of westslope cutthroat and a group of wild Kamloops were raised to catchable size at low densities, and they averaged 901 to 951. We will again be monitoring fin condition during the 1994 stocking season.

FISH SPAWNING

Deadwood (Early) Kokanee

Nampa Hatchery continues to operate the early kokanee salmon trapping and spawning project at Deadwood Reservoir. Installation of weirs and traps began on August 13, 1993. Weirs were installed on Trail Creek, Wild Buck Creek, and Basin Creek. The weir, trap, and velocity barrier on the Deadwood River was completed on August 14, 1993. The first kokanee salmon adults were trapped on August 17, 1993, and trapping continued through September 15, 1993. The main weir and trap was pulled on September 16; the velocity barrier remained in preventing upstream migration. Six hundred pair of kokanee were released above the velocity barrier on Deadwood River, with an additional 600 pair released above the weir at Wild Buck and Basin Creek. The Trail Creek weir was blown out by leaves and high water twice, and tampered with on one occasion. An estimate of 2,000 pair of kokanee above this weir is realistic. All fish were spawned at the trap site. An egg yield of 4,617,278 eggs were taken from 28,478 females for a fecundity rate of 162 eggs per female. (Appendix I). Average total length of kokanee females was 214.3 mm (Figure 1). Males averaged 209.5 mm. Fecundity along with average total length both increased slightly in 1993, but remained below historical averages (Figure 1). Egg eye-up increased dramatically from the 641 achieved in 1992; Mackay Hatchery reported an egg eye-up of 931 and Cabinet Gorge Hatchery reported 81.41 eye-up.

Deadwood early spawning kokanee continue to maintain a virus-free disease history. Results from pathological examinations in 1993 were again negative (Appendix H).

Eggs were shipped to both the Mackay and Cabinet Gorge hatcheries via fixed-wing aircraft. Shipping techniques were identical to those used during 1992. As in 1992, IDFG contracted out the flying service with McCall Air Taxi. A total of 200 surplus adult kokanee were out-planted into the ponds at Morrison-Knudson Nature Center.

A weir and trap was installed on Mores Creek on November 19, 1993. The weir collapsed the first night due to ice and slush moving down Mores Creek. The weir needed constant cleaning to prevent ice build-up and several pickets were removed at night to allow ice to pass more freely. No fish were trapped as of November 18, 1993, and the weir was removed. Apparently the run was earlier, as several spawned out kokanee were collected floating downstream. Eight carcasses were collected and measured, having an average length of 399.4 mm.

HATCHERY IMPROVEMENTS

Several important improvements were implemented at Nampa Hatchery during 1993:

1. An air diffuse cleaning system was completed on the lower two sections of the production raceways.

2. Three 20-horsepower motors were installed on our production wells 2, 3, and 6 increasing our water supply by 25%.

3. Three new packed columns were purchased and installed on wells 2, 3 and 6.

4. New headbox covers for the production and broodstock raceways were built and installed.

5. A bird screen enclosure was constructed (95% complete) over the production and brood stock raceways.

6. A new hatchery alarm system was installed for power, water, and security.

7. The hatchery conference and storage rooms were converted into eight offices and one small conference room for resident fish research personnel.

8. The hatchery purchased and constructed a 24 ft x 50 ft covered shelter over four fry raceways.

9. The hatchery purchased 16 Low Head Oxygen (LHO) boxes for out production raceways.

10. The hatchery also purchased (capital outlay) new gas furnaces for the dorm and residence #1.

PUBLIC RELATIONS

Since the completion of the Wilson Springs Ponds, most of the special fishing privileges on the settling pond were canceled. However, groups like the Disabled Vets and significantly handicapped patients from the Idaho State School will continue to fish the settling pond upon their request. Nampa Hatchery continues to provide guided tours to school and scout groups during the spring and summer months. The hatchery crew has given a number of talks and presentations to local area schools.

ACKNOWLEDGEMENTS

Nampa Hatchery staff for 1993 included Rick Alsager, Fish Hatchery Superintendent III; Dan Baker, Fish Hatchery Superintendent I (replaced Rick Lowell who was promoted to Superintendent III at Rapid River); Rob Morris, Fish Culturist; Gary Ady, Fish Transport Operator; and Steve Pogue who resigned as Fish Transport Operator and this position has not yet been filled. Bio-aides for 1993 included Dev Miller, Jeff Heindel, Chuck Keister, Boone Petersen, Joe Fowble, and Kevin Werre. Two students from Borah High School and two students from Nampa High School participated in work study programs. Their help was much appreciated.

Appendix A. Fish requested and produced at Nampa Hatchery during 1993.

Species	Size	Production goal	Actual production	% of goal achieved
Rainbow	3-5 inches	100,000	110,602	110.6%
Brown	3-5 inches	69,500	101,170	145.6%
Lahonton	3-5 inches	121,000	172,875	142.9%
Kamloop	3-5 inches	180,000	180,580	100.3%
Kamloop	5-7 inches	255,000	281,024	110.2%
Rainbow/Kamloop	9-12 inches	470,000	475,356	101.1%
Rainbow	broodstock	3,000	4,685	156.2%
Kamloop	broodstock	1,000	1,780	178.0%
Totals		1,199,500	1,328,072	110.7%

Appendix B. Fry production at Nampa Hatchery 1993.

Species/ Strain	Source & date	Number received	Yield number	Yield pounds	Percent Survival egg to plant	Destination	Cost to Produce & stock	Cost/ fish	Cost/ pound
cutthroat/C6	Omak 5/93	100,000	72,856	53	72.9%	Regions 2,3	$716.84	$0.01	$13.53

Appendix C. Fingerling production at Nampa Hatchery, 1993.

Species/ Strain	Source & date	Number received	Yield number	Yield pounds	Percent Survival egg to plant	Destination	Cost to produce & stock	cost/ fish	Cost/ pound
Rainbow/ R9	Hayspur 12/92	138,200	110,602	3,699	80.0%	Region 3	$8,504.49	$0.08	$2.30
Kamloop/ K3	Black Canyon 1-3/93	608,500	461,604	23,849	75.9%	Regions 1,2,3	$38,884.60	$0.08	$1.63
Cutthroat/ C6	Omak 5/93	145,000	100,019	1,525	69.0%	Region 6	$5,593.90	$0.06	$3.67
Brown/ BN	Saratoga 12/92	NA*	97,170	3,559	NA	Region 3	$13,020.46	$0.13	$3.66
Brown/	Saratoga	NA*	4,000	130	NA	Sandpoint	$463.74	$0.12	$3.57
Totals			773,395	32,762			$66,467.20	$0.09	$2.03

*Received as fingerlings.

Appendix D. Catchable production at Nampa Hatchery, 1993.

Species/ Strain	Source & date	Number received	Yield number	Yield pounds	Percent Survival egg to plant	Destination	Cost to produce & stock	Cost/ fish	Cost/ pound
Rainbow/ R1	Ennis	NA*	3,110	1,200	NA	Region 3	$2,921.46	$0.94	$2.43
Rainbow/ R7	Creston 3 & 4/92	81,000	46,184	17,765	57.0%	Regions 1,3	$19,462.38	$0.42	$1.10
Rainbow/ R7	Creston 3 & 4/92	18,000	10,260	3,800	57.0%	Transfer to McCall	$4,394.36	$0.43	$1.16
Rainbow/ R9	Hayspur 12/92	214,488	165,944	42,900	87.0%	Regions 3,5	$52,810.69	$0.32	$1.23
Rainbow/ RC	Henrys Lake	NA	26,708	9,523	NA	Region 3	$13,910.52	$0.52	$1.46
Kamloop/ K1	Gloyds 10/91-1/92	81,000	59,446	24,348	73.0%	Region 3	$26,674.36	$0.45	$1.10
Kamloop/ K1	Gloyds 10/91-1/92	81,000	59,520	24,000	73.0%	Transfer to McCall	$26,293.11	$0.44	$1.10
Kamloop/ K2	Cabinet Gorge 8/92 & 12/92	NA*•	87,959	21,048	NA	Region 7	$28,183.29	$0.32	$1.34
Kamloop/ K2	Cabinet Gorge 8/92	NA*	8,500	3,400	NA	Transfer to McCall	$5,173.41	$0.61	$1.52
Cutthroat/ .C2	Sandpoint 12/92	NA*	7,725	2,575	NA	Regions 3,7	$3,447.93	$0.45	$1.34
Totals			475,356	150,559			$183,271.51	$0.39	$1.22

*Received as fingerlings.

Appendix E. Broodstock production at Nampa Hatchery, 1993.

Species/ Strain	Source & date	Number received	Yield number	Yield pounds	Percent Survival egg to plant	Destination	Cost to produce & stock	Cost/ fish	Cost/ pound
Rainbow/ R9	Hayspur	5,000	3,275	6,173	NA	Hayspur	$6,717.44	$2.05	$1.09
Rainbow/ R9	Hayspur.		1,410	3,250	NA	Region 3	$4,299.88	$3.05	$1.32
Kamloop/ K1	Gloyds	2,000	1,480	3,247	NA	Hayspur	$3,696.38	$2.50	$1.14
Kamloop/	Gloyds		300	625	NA	Region 3	$830.75	$2.77	$1.33
Totals			6,465	13,295			$15,544.45	$2.40	$1.17

Appendix F. Eggs received at Nampa Hatchery, January 1, 1993 to December 31, 1993.

Species/ Strain	Date received	Source	Number	Destination	Expected yield	Cost/ 1,000
Kamloop/K3	1/93	Black Canyon	174,767	Regions 1,2	104,000	10.00
Kamloop/K3	2/93	Black Canyon	217,391	Region 3	130,000	10.00
Kamloop/K3	3/93	Black Canyon	216,371	Regions 3,5	130,000	10.00
Cutthroat/C6	5/93	Omak	245,000	Regions 3,6	175,000	N/C
Kamloop/K1	6/93	Trout Lodge	245,000	Region 3	152,000	10.00
Kamloop/K1	8/93	Trout Lodge	216,000	Region 3	130,000	10.00
Kamloop/Kl	9/93	Trout Lodge	200,000	Regions 1,2,4	120,000	10.00
Fall chinook/SC	11/93	Sandpoint	30,000	Region 1	15,000	N/C
Brown/BN	11/93	Saratoga	100,000	Regions 1,3	60,000	N/C
Brown/BN	11/93	Manchester	15,000	Region 3	8,000	N/C
Rainbow/R9	11/93	Hayspur	101,162	Regions 2,3	75,000	N/C
Rainbow/R9	12/93	Hayspur	259,062	Region 3	194,000	N/C
Rainbow/R9	12/93	Hayspur	153,363	Region 3	115,000	N/C
Totals			2,173,116		1,408,000	

Appendix G. Nampa Hatchery feed costs, 1993.

Type	Source	Pounds	Cost/pound	Cost
#1	Rangens	1,250	0.44	550.00
#2	"	5,000	0.44	2,200.00
#3	"	10,750	0.44	4,730.00
#4	"	17,500	0.2978	5,211.50
Soft-moist str.	"	176	0.7402	130.28
CC	"	5,000	0.2978	1,489.00
CC bulk	"	24,850	0.2928	7,276.08
1/8	"	20,550	0.2382	4,895.01
1/8 low phos.	"	33,830	0.2987	10,105.02
5/32	"	46,720	0.2382	11,128.70
5/32 low phos.	"	56,160	0.2987	16,774.99
1/4 brood	"	18,300	0.2898	5,303.34
Medicated				
#1 TM	"	0	0.5065	0.00
#2 TM	"	500	0.5065	253.25
#3 TM	"	1,050	0.5065	531.83
#4 TM	"	3,150	0.5065	1,595.48
CC TM	"	4,000	0.5065	2,026.00
3/32 TM	"	6,550	0.488	3,196.40
1/8 TM	"	1,000	0.488	488.00
5/32 TM	"	750	0.488	366.00
Medicated				
Str. 02 TM	Bioproducts	793	1.0996	871.98
5.0 mm TM	"	309	1.196	369.61
8.0 mm TM	"	309	1.196	369.61
Non-medicated				
Str. #1	"	572	0.930	531.96
Str. #2	"	176	0.930	163.68
Str. #3	"	396	0.930	368.28
1.0 mm	"	882	0.700	617.40
1.5 mm	"	2,072	0.700	1,450.40
2.5 mm	"	2,424	0.700	1,696.80
3.0 mm	"	3,484	0.700	2,438.80
4.0 mm	"	4,851	0.700	3,395.70
5.0 mm	"	529	0.700	370.30
8.0 mm	"	573	0.700	401.10
1.0 mm Biodry	"	250	0.395	98.75
1.5 mm Biodry	"	400	0.395	158.00
2.0 mm Biodry	"	500	0.395	197.50
2.5 mm Biodry	"	1,000	0.395	395.00
Total pounds		276,606		
Average cost/pound			$0.333	
Total Cost				$92,145.74

Appendix N. Summary report of Eagle Fish Health Laboratory results for Nampa Hatchery (Class C), January 1 – December 31, 1993.

Brood Year	Stock	Species	Accession	IHN	IPW	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
1992	Creston	Rainbow	93-129a	-	-		-	-	-	-					+	DX: GBD (107% TDG); Viro 0/10, ELISA 0/10, Bacte NSG
1992	Wstslpe	Cutthroat	93-129b	-	-		-	-	-	-					+	DX: GBD (107% TDG); Viro 0/10, ELISA 0/10, Bacte NSG
1992	Gerrard	Kamloop	93-129c	-	-		-	-	-	-						DX: Negative for pathogens; Viro 0/10, Bacte NSG
1993	Blk Can	Kamloop	93-240					-	-	-						DK: Stress-Handling(suspect),Bacteremia; Aeromonas sp. 1/16
Brood	Deadwd	Kokanee	93-412	-	-		+	-	-	-		-	-			IX: RS; Viro 0/60, FA 0/61, ELISA 4/12 (Low) WHG 0/20, CSH 0/20, Bacte NSG
1992	Hayspur	Rainbow	93-482	-	-		-									IX: Negative for pathogens; Viro 0/22, FA 0/22, ELISA 0/20
1993	Hayspur	Rainbow	93-483	-	-		-									IX: Negative for pathogens; Viro 0/35, FA 0/35, ELISA 0/35
1993	TrtLodge	Kamloop	93-546												+	DX: EGD, GBD(suspect) 101.4% TDG; Necropsy detected sestonosis, bubbles In gill arches, and distal filament

IHN Infectious Hematopoietic Necrosis virus
IPN Infectious Pancreatic Necrosis virus
EIBS Erythrocytic Inclusion Body Syndrome virus
BKD Bacterial Kidney Disease (Renibacterium salmoninarum)
RS Positive for Renibacterium salmoninarum but not clinical disease FUR Bacterial Furunculosis (Aeromonis salmonicida)
ERM Enteric Redmouth Disease (Yersinia ruckeri)
CWD Coldwater Disease (Flexibacter psychrophilus)
PKD Proliferative Kidney Disease (PKX)
WHD Whirling Disease (Myxosoma cerebralis)
CSH Ceratomyxa shasta
ICH Ichthyophthirius multifilis
GBD Gas Bubble Disease

IX Inspection (routine hatchery visit)
DX Diagnostic (sampled because of sick fish)

Appendix I. Kokanee egg take at Deadwood Reservoir, 1993.

Lot #	Spawn date	Females spawned	Green eggs	Eyed eggs	Percent eye-up
1	30-Aug-93	555	98,300	81,474	82.9
2	01-Sep-93	1,498	221,600	200,840	90.6
3	03-Sep-93	2,037	326,677	299,797	91.8
4	06-Sep-93	2..236	373,330	352,176	94.3
5	07-Sep-93	2,721	456,663	446,256	97.7
6	08-Sep-93	2,725	463,330	422,214	91.1
7	09-Sep-93	2,645	441,153	410,456	93.0
8	10-Sep-93	3,073	466,825	378,128	81.0
9	13-Sep-93	3,463	527,600	376,706	71.4
10	14-Sep-93	3,632	615,500	541,025	87.9
11	15-Sep-93	3,894	626,300	544,881	87.0
Total		28,478	4,617,278	4,053,953	87.8

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

SANDPOINT FISH HATCHERY

1993

Prepared by:

Scott D. Peterson, Fish Hatchery Superintendent I

INTRODUCTION

The Sandpoint Hatchery is located in Bonner County on the south shoreline of the Pend Oreille River about two miles south of the town of Sandpoint. High fish production costs closed the hatchery in 1985; however, it reopened in 1990 because of public demand. Public relations with Trout Unlimited (TU) and Lake Pend Oreille Idaho Club (LPOIC) is the primary duty of the station. Other duties include managing a small-scale specialty station rearing trout, salmon, and sturgeon and operating or helping in north Idaho egg-taking programs.

The hatchery is licensed funded with $17,400 for operating. Special hatchery programs (sturgeon culture and cutthroat trout net pen culture) are funded by Bonneville Power Administration (BPA), Washington Water Power (WWP), TU, and LPOIC. These funds are encumbered for specific use items such as water heaters, net pens, and fish feed; therefore, amounts vary annually.

The hatchery was staffed with a Hatchery Superintendent I and a full-time bio-Aide in 1993. Staffing adjustments were made while the hatchery superintendent pursued his Master's Degree from the University of Idaho. The 1993 budget allocated one Hatchery Superintendent I and eight months of non benefitted labor. Elimination of the Superintendent I position has been proposed for fiscal year 1995.

Water Supply

The hatchery water supply consists of 500 to 600 gallons per minute (gpm) of 7°C water from Murphy Spring #3. Springs 11, 12, and #4 have not been developed for hatchery use, although their discharge is included in the 4 cubic feet per second (cfs) water right. The hatchery flow fluctuates seasonally, with lowest flows in late summer and highest flows in early spring.

The Idaho Department of Fish and Game (IDFG) was deeded the springs in 1928. However, this deed did not include property ownership of the surrounding land. The easement agreement states that IDFG will provide a 2-inch domestic line to the land owners in exchange for a collection reservoir and pipe-line right-of-way from the springs to the hatchery.

The water right to Spring 02 has been waived to the South Side Sewer District in the amount of 300 gpm. This water may be reclaimed for hatchery use if needed.

Rearing Facilities

The hatchery rearing facilities include 8 Heath incubators (8-tray), 18 cement vats (15 ft x 2.5 ft x 3 ft) inside the hatchery building, and 2 outdoor reuse raceways (100 ft x 5 ft x 2 ft). Two vats have been modified with heaters for warm water rearing. The carrying capacity of the hatchery ranges from 880 pounds (2.5 million) of 1-inch fish to 12,800 pounds (25.5 thousand) of 10-inch fish (Figure 1).

Off-site hatchery rearing facilities include 8 net pen frames and 11 net pens (20 ft x 20 ft x 20 ft) with assorted mesh sizes ranging from 1/4-inch to 1 1/4-inch. A carrying capacity for net pens has not been established, but a maximum of 1,000 pounds per pen has *shown* good results.

The hatchery buildings consist of one nursery/shop/office complex, one storage shed, a garage/crew quarters, and a residence. Regional IDFG enforcement personnel constructed a shed and boat storage during 1993.

Hatchery Improvements

No dramatic improvements were made to the hatchery this year. The hatchery did purchase a dozen hatching trays and Lotus 1-2-3.

Two rearing pen nets and one frame were purchased by WWP and LPOIC. Outside funding for capital outlay replacement is required to maintain the net pen rearing project since IDFG funds are unavailable.

The most significant needs for hatchery operations are a new 4 x 4 pick-up truck and mobile radio. These items have been budgeted since 1991, but have not been funded due to statewide budgetary cuts. Other items needed include office furniture, egg hatching trays, and increased funding to upgrade the temporary position to bio-aide.

FISH PRODUCTION

The Sandpoint Hatchery produced 5,494 pounds of fish from 9,687 pounds of feed (1.76 conversion), with production costs estimated at $10.49 per pound gain and $27.34 per thousand fish or eggs (Appendix A). Weight of the kokanee broodstock was not added into production pounds (fish die after spawning), but the feed they consumed was added into the total feed fed. The hatchery's feed conversion rate is inflated, reflecting the lost weight production of kokanee broodstock.

The hatchery started the 1993 production year with 423,370 fish weighing 3,395 pounds, excluding the kokanee broodstock (Appendix B). A total of 1,777,690 (5,593 pounds) fish and eggs were received, with an additional 230,000 (38 pounds) eggs spawned from kokanee broodstock, during the production year (Appendix C). The Sandpoint Hatchery ended the year with 1,702,794 fish and eggs on station weighing 6,372 pounds (Appendix D).

FISH HEALTH

Pathologists from the Eagle Fish Health Laboratory visited the Sandpoint Hatchery on three dates, but inspection samples were only collected on one occasion. The brood year 1990 captive kokanee broodstock males were sampled at spawning and found to be free from pathogens (Appendix 8). This was of interest in that captive Sullivan Springs kokanee held at Cabinet Gorge or Clark Fork hatcheries all experienced clinical episodes of bacterial kidney disease (BKD) in 1993. In addition, kokanee spawners which returned early to the Cabinet Gorge Hatchery were transferred and held for spawning at Sandpoint. Twenty of these fish were sampled and found to be free of replicating viruses, but were positive for Renibacterium salmoninarum (RS) by both DFAT, (6 of 20 with 1 light, 4 moderate, and 1 heavy), and ELISA (3 of 4 pools= 1 low, 2 high). Eggs from these fish were kept at Sandpoint to back up Cabinet Gorge Hatchery.

Ovarian fluids and kidney samples from three female fall chinook spawners, captured in Wolf Lodge Creek, were sent to the Eagle Lab for analysis. No viruses were detected, but one fish was positive (ELISA low) for Renibacterium salmoninarum. All eggs from the fall chinook spawning were eventually transferred to Nampa Hatchery.

The Montana westslope cutthroat have not done particularly well. A high percentage of these fish demonstrate physical deformities such as shortened opercles, blunt noses, misshapen heads, and spinal deformities. Excessive outbreeding in this population may have reinforced undesirable genetic traits.

The disease classification of Sandpoint Hatchery is currently "C" because of the open water supply and history of BKD and white sturgeon irridovirus (WSIV). This classification could be upgraded if more care was taken in importing potentially diseased fish onto the facility. The benefit would be greater leeway in where fish from Sandpoint could be shipped.

Recommendations for 1994:

1. Establish some isolation vats to rear disease-free westslope cutthroat broodstock, (see Clark Fork Hatchery Fish Health section).

2. Do not bring live kokanee on station. Consider bringing Sullivan Springs eggs to Sandpoint to alleviate crowding at Cabinet Gorge or to back up other programs.

3. Make use of Sandpoint for incubation and early rearing of brook trout destined for production at Clark Fork Hatchery.

Under the directive of the Eagle Fish Health Laboratory personnel, non-labelled chemical use to control disease is prohibited. Only prophylactive use of chemicals, such as iodophores or formalin, and licensed use of erythromycin (with proper INAD) antibiotic is used for fish health management. All other chemicals have been eliminated from this station.

To improve current operations of north Idaho hatcheries, developing a "disease-free" source of westslope cutthroat trout is necessary to meet regionwide needs and streamline costs. The Clark Fork Hatchery has not overcome the pathogen-free water source obstacle that results in high fry mortalities and a quarantine status on production. Therefore, a westslope cutthroat trout broodstock was initiated at the Sandpoint Hatchery using the Montana strain; a disease-free source. Two age classes are being held for egg production that could start in 1996.

Although the Montana strain may not be the best source of broodstock to meet Idaho's needs, they were the only disease-free eggs readily available to test Sandpoint's ability to produce eggs. If egg production is proven plausible, it is recommended that the Montana strain be replaced with a local strain, such as Upper Priest Lake westslope cutthroat.

FISH SPAWNING

Chinook

The chinook trap was installed in Wolf Lodge Creek by regional fishery biologists in early September 1993. Criteria for broodstock selection included:

1. Size - females over 18 pounds

2. Timing - fish entering the trap before October 1

3. Pairs a minimum of 25

The Wolf Lodge weir trapped 58 fish; 47 before October 1, and 11 fish after. We selected 27 fish, 16 females and 11 males, ranging from 9 to 23 pounds, for broodstock. Only the timing criterion was met. From these 16 females, 35,500 green eggs were spawned resulting in 30,500 eyed eggs (86% survival) shipped to Nampa.

Ranking the brood stock selection criteria will be helpful to the long-term success of the program. Selecting 25 pairs should be the first objective. From a hatchery viewpoint, long-term brood management is the priority. Therefore, reducing the chance of inbreeding is the most important criterion. Selection for run timing and adult size reduces the genetic variation within the population. Broodstock selection may compromise our ability to prevent inbreeding; however, we can lower our risk by breeding a minimum of 25 pairs.

Fish returns in 1994, 1995, and 1996 may be poor because of low stocking numbers in 1992, no stocking in 1993 (Appendix G), and the elimination of natural spawning in Wolf Lodge Creek since 1989. Maintaining genetic diversity during these years is critical to the future success of the program, highlighting the importance of the spawning pairs criteria during these years. Selection for run timing and adult size may not be appropriate for the next three years.

Short-term management options have not provided the desired results, therefore, long-term management options should be considered for chinook population management. For successful broodstock management, enough smolts should be released or produced naturally to provide a minimum of 25 returning pairs of adults (an effective breeding population) to prevent genetic "bottlenecking." Results from past releases show return rates vary, ranging from 0.17% from the 1990 release to 0.37% from the 1989 release (Appendix G). For a long-term broodstock management using hatchery supplementation, 25,000 smolts should be released annually.

It is recommended to release a minimum of 25,000 smolts annually, or manage natural smolt production and eliminate hatchery supplementation. It is not recommended to do both.

FISH FEED

Normal production feed is purchased from Bioproducts, Inc. in Warrenton, Oregon. Fish are started on Biomoist Starter #2 and #3, progressing to Grower 11 and Biodry 4000 for growout. Specialty production feeds, Biokyowa and Rangens Semi-moist salmon feed are fed to sturgeon. Ration quantity is adjusted weekly

and is calculated using Haskell's formula. Feed purchased and its cost during 1993 is found in Appendix H. Discrepancies in feed fed verses feed purchased in 1993 is due to holdover feed.

PUBLIC RELATIONS

About 2,000 people toured the Sandpoint Hatchery in 1993. Effort was made to talk with every tourist visiting the *hatchery.* Tourist groups varied from recreational to professional, with most leaving the hatchery with a good opinion of Idaho Department of Fish and Game (IDFG). Excellent relations were maintained with TU and LPOIC, though the managers' time was spent divided between University of Idaho, Moscow and work. Hatchery personnel manned a booth with a fish display at the annual TU banquet. A tour of Lake Pend Oreille was provided to TU dignitaries. Hatchery personnel also gave multiple presentations to the LPOIC organization. Both groups are enthusiastic about helping the resource, and would do more if given the opportunity.

The Sagle Elementary school is still involved in *hatching* kokanee eggs in a small aquarium and releasing fry into Garfield Bay Creek, Lake Pend Oreille. The Sandpoint Hatchery personnel deliver the eggs and give a short presentation regarding kokanee life history in Lake Pend Oreille. The program is designed for natural resource education.

SPECIAL PROJECTS

Sturgeon

Two age classes, 1992 and 1993, of sturgeon are rearing at the Sandpoint Hatchery (Appendix D). The 1992 class is divided into two vats; an ambient water vat with 51 fish (mean length 35 cm), and a heated (16°C) water vat with 21 fish (mean length 55 cm). The 1993 class is in one warmwater vat with 185 fish (mean length 10.5 cm). The weight:length relationship of these fish has been measured at C=0.00016 or K=0.0000044 (total length).

The 21 fish (1992 cohort) rearing in heated water are destined for release in the Kootenai River during the summer of 1994. These fish must be large enough to carry radio transmitters. These fish will range in size from 900 to 1,500 grams by August 1 1994.

The 115 fish (1993 cohort) reared in heated water have no destination. Live "gene banking" is the purpose of these fish in case of Kootenai Hatchery failure.

The 51 fish (1992 cohort) rearing in ambient water are marked fish in a vat not allocated for sturgeon culture. Fish are marked with either scutes removed or floy-tagged. The alleged purpose of these fish is to test mark recognition. Since this water is cold (7°C), fish will grow very little over the next few months. Regeneration of scutes may not occur without somatic growth; therefore, the result of this test may not provide reliable answers regarding our ability to recognize marked fish decades after release.

Project funding of $8,000 by the Kootenai Tribe merits special project status for sturgeon culture at the Sandpoint Hatchery. Two vats modified with heaters and pumps (recirculating) have been allocated to sturgeon culture. Fish production in these two vats is limited by fish waste products (nitrogenous), which degrades the water quality. Water quality limits production when fish

weight exceeds 50 pounds per vat. Therefore, vats are limited to a specific number of fish for the allowable 50 pounds (22.7 kilos). Although a "product definition" of fish size and numbers has never been made, it was important to define the carrying capacity of the hatchery. In summary, the following number of fish can be produced using both vats (100 lbs allowable weight) at the Sandpoint Hatchery:

Fish Number	Mean Weight (g)	Mean Length (cm)	Rearing Duration
10,000	4.5	10.2	5 months
5,000	9.0	12.7	6 months
1,000	45.4	21.7	10 months
500	90.8	27.3	14 months
100	454.4	46.8	19 months
50	908.8	58.9	24 months
10	4,544.0	100.0	*40 months

*projected duration

Piper's (1970) density and flow indices have been applied to sturgeon reared at Sandpoint using the same guidelines as those applied to trout. It is recommended that a density index not exceed 0.5 to allow all fish a "resting" position on the raceway bottom.

Net Pens

Donations by TU, LPOIC, and WWP of about $4,000 in 1993 merits special project status for westslope cutthroat trout net pen culture on Lake Pend Oreille.

A total of 46,160 fish was released from six net pens in Scenic Bay and Garfield Bay May 15 and 16, 1993. These fish weighed 5,150 pounds (Appendix F), converted feed at 1.38:1, and averaged 6.8 inches. Grow out survival ranged from 648 to 100%, with a mean of 77%. The fish reared in large mesh nets (1 inch) produced the lower survival rates, as fish escaped through or gilled themselves in the mesh. A maximum 3/4-inch mesh should be used when loading age 1+ fish.

A creel survey was conducted on five weekend days between April 10 and May 9 by Sandpoint Hatchery personnel. A total of 52 bank anglers was surveyed. They fished for 114 hours and caught five cutthroat trout, of which two had net pen origin.

A total of 65,970 fish was loaded into eight net pens on Lake Pend Oreille; four at Scenic Bay, three at Garfield Bay, and one at Hope. Clark Fork Hatchery personnel loaded pens in October 1993 when surface temperatures dropped below 13°C. Three pens, two at Garfield Bay and one at Hope, were loaded with age 2+ fish eight inches long. These fish may provide immediate and better returns to the creel. In addition, larger fish allow us to use larger mesh sizes that are easier to clean and tend.

Kokanee Broodstock

Techniques for rearing kokanee broodstock were developed at the Sandpoint Hatchery between 1990 and 1993 using two age classes (1990 and 1991) of late-spawning, Lake Pend Oreille kokanee. About 23,000 (1990 age class) and 65,000

(1991 age class) kokanee fry 50 to 60 mm were obtained from the Cabinet Gorge Hatchery in July 1990 and 1991, respectively. Most of these fish were transferred back to the Cabinet Gorge Hatchery before spawning, however 491 (1990 age class) and 1,250 (1991 age class) fish were held until sexual maturity.

Areas of interest included age-at-maturity, size-at-maturity, sex ratios, growth rates, and fecundity. we also conducted a growth experiment to test the hypothesis the "physiological decision" to mature commences an irreversible process and it occurs before the summer preceding maturity. We accepted our hypothesis, and concluded that poor summer growth before maturity did not affect the maturation schedule; however, it did have significant effects on egg size and fecundity.

Materials and Methods

The 1990 kokanee fry were reared inside in 1,187-liter containers for the first year before they were moved outside into 15,882-liter containers. During the first week in October 1992, fish were moved inside (1,187-liter) for ease in handling and spawning. Immature fish remained inside and were spawned or killed in 1993. Maximum rearing densities were 0.5 for inside containers and 0.25 for outside containers.

The 1991 kokanee fry were reared inside in 1,187-liter containers (maximum density 1.56) until April 1992 before moving them outside into 15,882 liter containers (maximum density 0.25). On May 1, 1993, 762 fish were moved inside and divided into four containers (1,187-liter) with approximately 195 fish in each. Two containers were fed daily (1% body weight) and two containers fed intermittently (1% body weight daily the first seven days of the month and nothing the rest of the month). Fish were measured monthly.

Fish were fed Bioproducts Biodry 4000 and brood diets. The 1990 age class was fed a brood diet only in 1993. The diet at the Cabinet Gorge Hatchery included Rangen Semi-moist salmon starter and Oregon Moist IV.

Results were tested using analysis of variance, randomization permutations, and multiple t-tests at 0.05 alpha level.

Results

Male kokanee matured sexually at one, two, three, and four (or older) years of age (AFS aging). Fish not mature sexually as 3-year-olds were considered 4-year-olds or older maturing fish. Males predominantly matured as 2-year-olds (Figure 2) and were significantly ($P<.001$) larger than mature females and immature fish of the same age. Female kokanee matured at 2 and 3 years of age in about equal proportions (Figure 2). As expected, the 3-year-old females were large and produced larger and more eggs than the 2-year-olds. Older maturing fish were typically larger at maturation (Figure 3), but grew at a slower rate.

Growth rates were estimated by calculating daily delta length. Rearing time was 581 days for 1+ spawners, 946 days for 2+ spawners, and 1,311 days for 3+ spawners (assumptions: all fry started on feed March 15 and adults stopped feeding October 15). Length gains were measured at 23 cm, 32 cm, and 37 cm for 1-, 2-, and 3-year-old spawners, respectively. Growth rates are summarized as: 1+ (0.041 mm/day or 0.016 inches/day), 2+ (0.033 mm/day or 0.013 inches/day), 3+ (0.028 mm/day or 0.011 inches/day). The importance of these results is recognition that faster growing fish often mature at a younger age. Selection for a large size at a specific age should, therefore, produce faster growing fish

(to that specific size and age) but at a "cost" of younger and smaller adult fish.

Fecundity for 2+ spawners was estimated at 960 per female (1990 cohort) and 1,280 per female (1991 cohort). The 1990 age class, spawning as 3+ fish, produced 1,460 eggs per female.

Sex ratios were 1.74:1 (male to female) from the 475 fish sampled in the 1990 age class and 1.23:1 (male to female) from 762 fish sampled in the 1991 age class.

Survival of green eggs (1990 cohort) to fry was 57% from the 2+ fish spawned in 1992. Spawning started in December, but continued through March 1993. Survival of eggs spawned in February and March was low (0% to 308). Overall, only 35.5% survived from green eggs to release.

Summer Growth Experiment

Since there was no significant difference in size at maturity (males and females) between the two vats reared on full ration nor between the two vats reared on intermittent ration, the two intermittent vats and the two full ration vats were combined for simplicity. Therefore, the feeding regimes produced two distinct sizes of kokanee. The fish fed full ration were significantly larger than fish fed intermittently ($P < 0.001$). Size at maturity, however, did not significantly effect the incidence of 2+ sexually mature fish.

For 2+ males, 63% and 51% matured in the two vats fed full ration compared to 60% and 58% matured in the two vats fed intermittently (Table 8). There was no significant difference among the four vats ($p = 0.56$). Therefore, the maturation data in the two intermittently-fed vats were combined with each other and the maturation data in the two full ration vats were combined with each. There was no significant difference in maturation schedules of 2+ males ($p=0.716$). Hence, growth preceding maturity did not effect the incidence of maturation of 2+ males.

For 2+ females, 25% and 39% matured in the two vats fed full ration compared to 399 and 40% matured in the two vats fed intermittently (Appendix J). There was a significant difference among the four vats ($p=0.037$). Using multiple t comparisons, the full ration vat with 25% sexually mature females was significantly different from the other three. Two scenarios could have caused this difference. The first, fast growth arrest maturation development. The second, we loaded a disproportional number of immature female fish into that container (vat 8). Since the first scenario contradicts literature reviews and is nonconclusive with the other full ration vat (significantly different), it is more likely we loaded more immature females into that container to start the experiment. Hence, slower growth preceding maturity did not lower the incidence of maturation of 2+ females.

Since summer growth preceding maturation did not lower the incidence of sexual maturation, we failed to reject our hypothesis, the "physiological decision" to mature commences an irreversible process and occurs before the summer preceding maturity. However, good summer growth prior to spawning significantly ($p < 0.001$) increased fecundity, egg size, and ovary weight (Appendix J).

Our results show that high rations will produce more and larger eggs in maturing kokanee, a semelparous species. In addition, our results suggest the "physiological decision" to mature occurs before May 1 of the spawning year, and

supports the hypothesis that the "physiological decision" to mature is an irreversible process to kokanee.

Clark Fork River Kokanee

A total of 1,460 kokanee trapped from the Clark Fork River in the Cabinet Gorge ladder was transferred to Sandpoint Hatchery. Fish were transferred due to space and water quality limitations at the Cabinet Gorge Hatchery. Females were selected for transfer.

Only 53% survived to be spawned. Spawned females produced 268,000 green eggs. Mean total length of male fish was 26.3 cm +/- 1.4 (one standard error), and female was 25 +/- 1.3 cm (one standard error), n-15 and n-75, respectively. on the first two spawn dates, milt from Granite creek males was transported and used to fertilize eggs. The remaining spawn dates, milt from captive broodstock males were used. Eggs will be incubated and reared at the Sandpoint Hatchery.

Prespawning mortality was not checked for fin clips. We detected three marked (2 LV and 1 RV) fish from the 769 fish spawned.

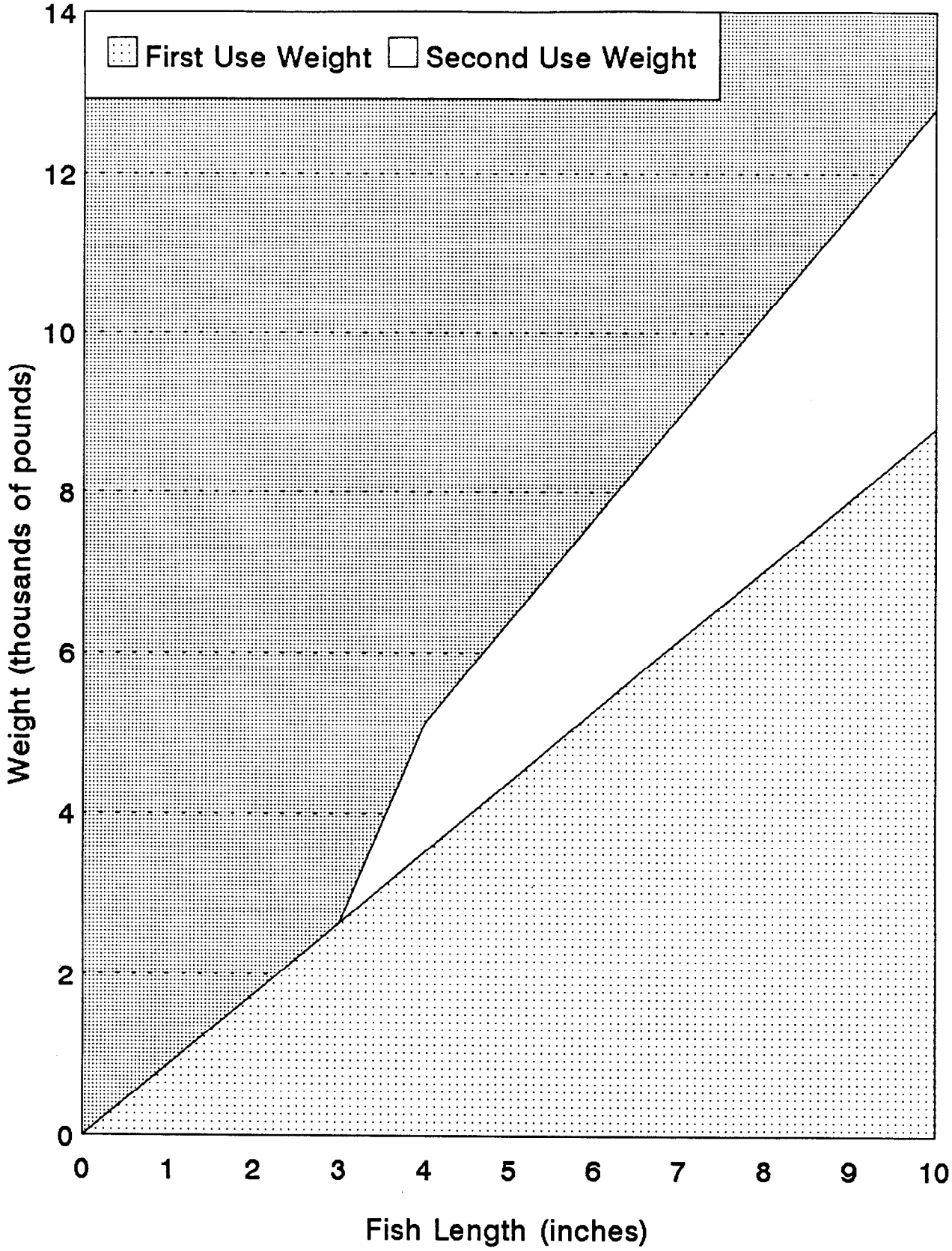

Figure 1. Carrying capacity of the Sandpoint Hatchery.

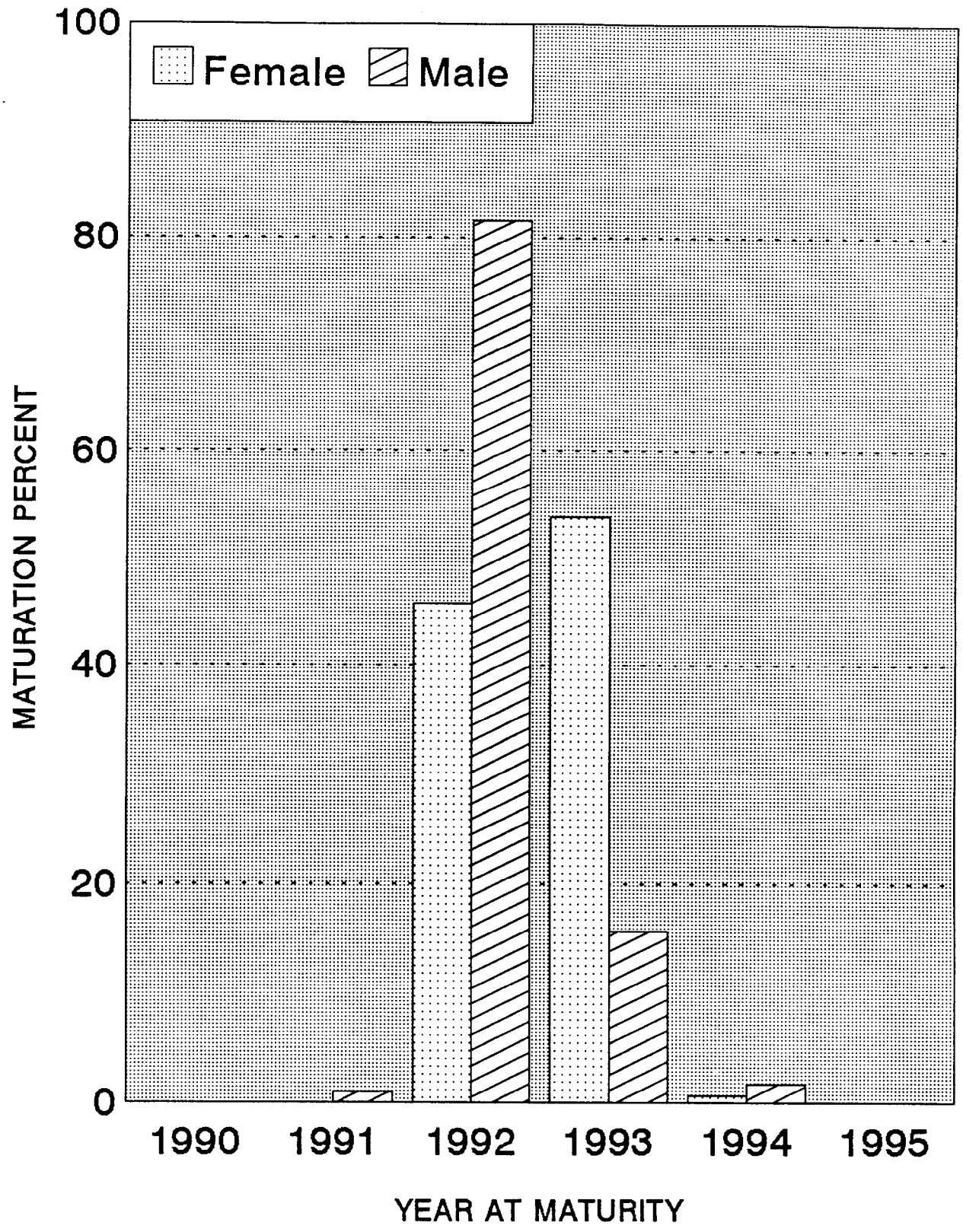

Figure 2. Age frequency of mature kokanee reared at the Sandpoint Hatchery (1989 spawn, 1990 cohort).

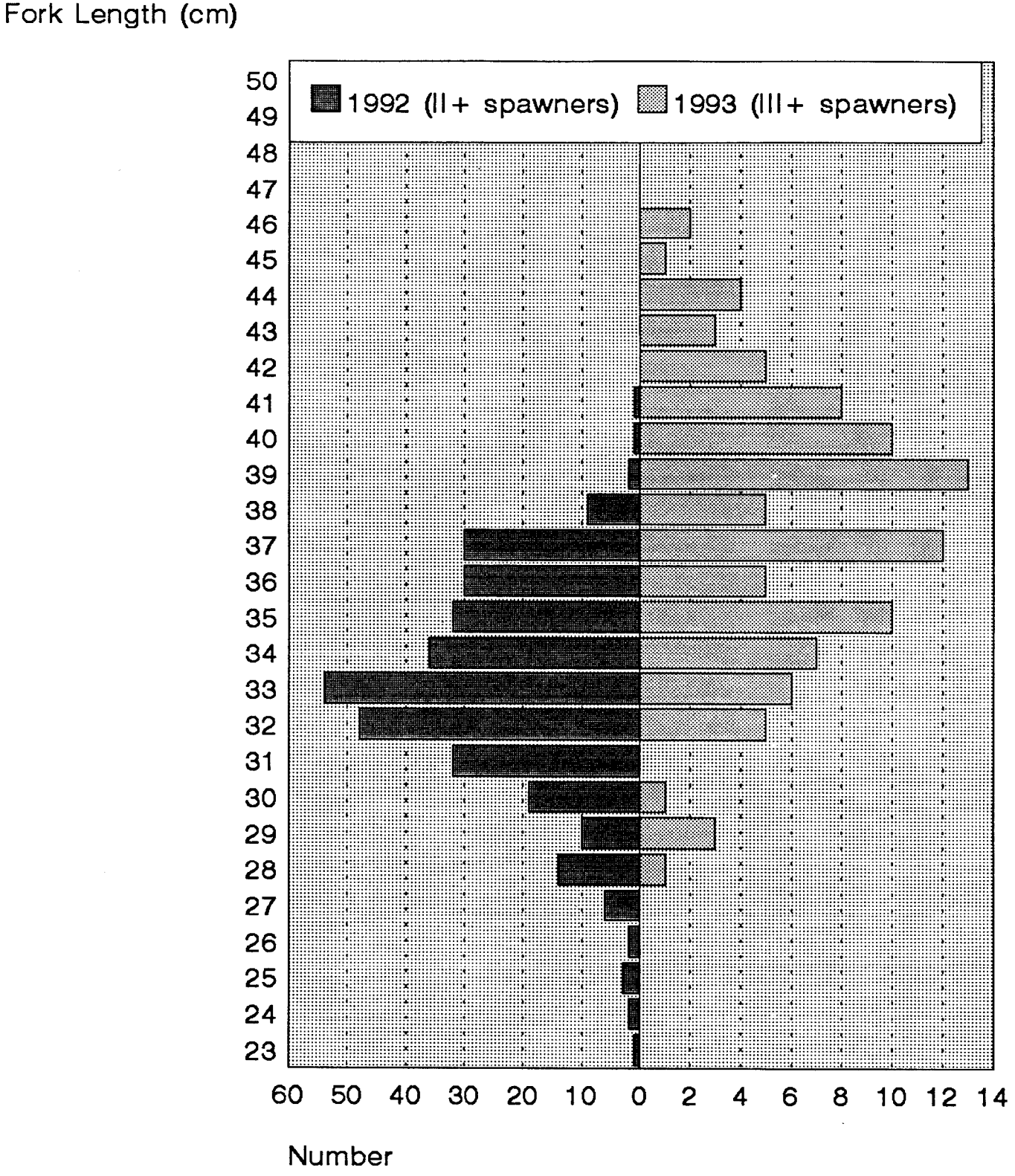

Figure 3. Fork length (cm) of mature kokanee spawned as two year olds (II+) in 1992 and and as three year olds (III+) in 1993.

Appendix A_ Production summary. Sandpoint Hatchery. 1993.

	Numbers	Weight Gain	Total Feed Fed	Conversion	Production Cost	Cost/lb Gain	Cost/1,000 Fish or Egg
TOTALS	2,108,803	5,494	9,687	1.76	57,650	10.49	27.34

The 1993 production cost (excluding capital outlay) were estimated from PY93 and FY94 budgets.

Appendix B. Fish and eggs at the Sandpoint Hatchery, January 1, 1993.

species	Stock	Numbers	Weight	Length	Fish/lb
Rainbow	92-Id-R9	200,000	24	0.80	8,170
Rainbow	91-BC-K2	920	42	5.08	22
*Cutthroat	90-Id-C2	58,000	3,050	5.60	19
Cutthroat	92-Mon-C2	90,000	200	1.93	400
Sturgeon	92-Id-St	450	30	6.90	15
RC Hybrids	92-Id-RC	4,000	40	2.99	106
**Kokanee	92-Id-KL	70,000	9	na	na
Totals		423,370	3,395		
Kokanee Brood -					
Kokanee	91-Id-KL	4,440		8.84	4.8
Kokanee	90-Id-KL	160		11.20	2.2

*Fish reared in net pens, Lake Pend Oreille
**Kokanee eggs produced from captive brood stock

Appendix C. Fish and fish eggs (received or collected) ion 1993.

Species	Stock	Numbers	Weight (lbs)	Length (inches)	Fish/lb	Receiving status	Source
Cutthroat	93-Non-C2	330,000	48	no	6,800	eyed eggs	Washo
*Cutthroat	92-id-C2	49,970	2,250	5.25	19.6	fingerling	Clark Fork
*Cutthroat	91-Id-C2	16,000	2,900	8.00	5.5	catchable	Clark Fork
Sturgeon	92-Id-St	705	19	4.95	48.4	fingerling	Kootenai
Sturgeon	92-Id-St	40	6	10.00	6.3	catchable	Kootenai
Sturgeon	93-Id-St	200	1	3.21	193.0	fingerling	Kootenai
Brown	93-BN	4,000	130	4.00	31.3	fingerling	Nampa
Kokanee	93-Or-KO	110,000	18	no	6,100	eyed egg	Wizzard Falls
RC Hybrid	93-Id-RC	5,000	1	na	6,800	eyed egg	Henry Lake
Kokanee	93-IdSS-KL	958,290	160	no	6,000	green egg	Pend Oreille
**Kokanee	93-IdCF-KL	267,985	45	na	6,000	green egg	Pend Oreille
***Kokanee	93-ldBr-KL	230,000	38	no	6,000	green egg	Sandpoint
Chinook	93-IdCDA-FC	35,500	15	no	2,270	green egg	Coeur dIAlene
TOTALS		2,007,690	5,631				

*Net pens
**Eggs collected from 1,460 kokanee adults in the Clark Fork River
***Eggs collected from broodstock (2 year classes) Granite Creek orgin

Appendix D. Fish and eggs at the Sandpoint Hatchery, December 31, 1993.

Species	Stock	Numbers	Current wt (lbs)	Annual wt gain (lbs)	Length	Fish/lb	Annual feed fed	Conver-sion	Produc-tion costs	Cost/lb gained	Cost/ 1,000 fish or egg
Cutthroat	93-Mon-C2	63,715	127	79	1.79	500.0	165.5	2.19	5,765	72.97	90.48
Cutthroat	92-Mon-C2	7,985	210	190	4.21	38.0	247.0	1.30	2,319	12.21	290.42
Cutthroat*	91-ld-C2	46 000	2,675	425	5.50	17.2	1,000	2.35	2,336	5.50	50.78
Cutthroat*	90-1d-C2	15.500	3,040	140	8.25	5.1	500	3.57	1,988	14.20	128.26
RC Hybrid	93-ld-RC	2,950	12	11	2.37	250.0	45	6.79	1,441	131.00	488.47
	93-id-St	185	2	1	4.12	89.0	2	2.0	663	633.00	na
Sturgeon	92-ld-St	72	45	20	16.0	1.58	177	5.54	1,988	99.40	na
Kokanee**	90-ld-KL	112	na	na	11.61	1.98	1,724	na	na	na	na
Kokanee	93-1 -KL	230 000	38	0	na	6 000.0	no	na	8,117	na	35.29
Kokanee	93-ldCF-KL	267.985	45	0	na	6,000.0	no	ne	2,816	na	10.51
Kokanee	93-idSS-KL	958,290	160	0	no	6,000.0	no	na	2,816	na	2.94
Kokanee	93-Or-KO	110,000	18	0	no	6 000.0	na	no	133	na	1.21
TOTALS		1 702 794	6,372	866			3 861		30,382		

*Actual sites Scenic and Garfield bays, Lake Pend Oreille.
**Alt costs deferred to eggs collected (93-IdSdp-KL).

Appendix E. Summary report of Eagle Fish Health Laboratory results for Sandpoint Hatchery (Class Q . January 1 - December 31, 1993.

Brood Year	Stock	Species	Accession	IHN	IPW	EIBS	BKD	FUR	ERM	CWD	PKD	WHD	CSH	ICH	GBD	Diagnoses
Brood	Wlf Lg	Fall Chnk	93-453	-	-		+									IX: RS; Viro 0/2, ELISA ½ (Low)
Brood	Wlf Lg	Fall Chnk	93-467	-	-		-									IX: Negative for pathogens; Viro 0/1, ELISA 0/1
Brood	Sulv Sp	Kokanee	93-579	-	-		-									IX: Negative for pathogens; Viro 0/10, FA 0/10, ELISA 0/10

IHN Infectious Hematopoietic Necrosis virus
IPN Infectious Pancreatic Necrosis virus
EIBS Erythrocytic Inclusion Body Syndrome virus
BKD Bacterial Kidney Disease (Renibacterium salmoninarum)
RS Positive for Renibacterium salmoninarum but not clinical disease
FUR Bacterial Furunculosis (Aeromonis salmonicida)
ERM Enteric Redmouth Disease (Yersinia ruckeri)
CWD Coldwater Disease (Flexibacter psychrophilus)
PKD Proliferative Kidney Disease (PKX)
WHD Whirling Disease (Myxosoma cerebralis)
CSH Ceratomyxa shasta
ICH Ichthyophthirius multifilis
GBD Gas Bubble Disease

IX Inspection (routine hatchery visit)
DX Diagnostic (sampled because of sick fish)

Appendix F. Fish and eggs transferred or released from the Sandpoint Hatchery, 1993.

Species	Stock	Numbers	Hauling Wt(Lbs)	Annual Wt gain (Lbs)	Length	Fish/lb	Annual Feed Fed	Convers-ion	Prod. Costs	Cost/Lb gained	Cost/ 1,000 fish or egg
Rainbow	92-id-R9	202,720	583	559	1.62	348	559	1.0	4,108	7.35	20.26
Rainbow	91-SC-K1	1,045	275	251	9.1	3.8	292	1.16	1,657	6.60	1,585.64
Cutthroat	90-Id-C2	46,160	5,150	2,100	6.82	8.96	2,900	1.38	4,307	2.05	93.31
Cutthroat	92-Mon-C2	1,800	28	24	3.45	64.3	26	1.08	133	5.54	73.89
Cutthroat	92-Mon-C2	88,475	1,660	1,464	3.76	53.3	1,775	1.08	3,313	2.26	37.44
RC Hybrids	92-Id-RC	3,310	124	84	4.7	26.7	93	1.11	1,425	16.96	427.80
Brown	92-Nampa-BN	4,000	130	0	4.0	31.3	0	na	66	na	16.50
Sturgeon	92-Id-St	450	21	21	6.51	20.6	0	no	1,988	94.67	4,417.78
Sturgeon	92-Id-St	69	41	11	15.8	1.68	71	5.54	1,988	180.73	na
Sturgeon	92-Id-St	331	12	12	5.8	28.2	0	na	1,988	165.67	na
Kokanee	91-Id-KL	50	25	20	10.0	2.5	40	2.0	166	8.30	3,320.00
Kokanee	93-Id-KL	27,000	30	29	1.40	900.0	30	1.0	331	11.41	12.26
Fall Chinook	93-IdCDA-FC	30,500	15	15					5,765	384.33	189.02
Bull Trout	91-Id-Bt	100	38	38	10.1	2.6	40	1.05	33	0.87	330.00
TOTALS		406,010	8,132	4,628			5,826		27,268		

Appendix G. Coeur d'Alene Lake fall chinook return summary, 1987 to present.

Release year	Number Released	Mark	Return year	Number return	Total return	Percent return
1987	59,400	AD	1989 1990 1991	69 59 2	130	0.22
1988	44,600	LV	1990 1991 1992	25 65 5	95	0.21
1989	35,000	RV	1991 1992 1993	56 84 2	130	0.37
1990	36,350	AD	1992 1993 1994	24 39 NA	63+	0.17+
1991	44,000	LV	19.93 1994	4	NA	NA
1992	10,000	RV	1993 1994	2		
1993	0					
1994	25,000?	AD?				

Weir moved to highway location and reduced natural spawning in Wolf Lodge Creek in 1989 which resulted in fewer naturally produced fish trapped in 1993.

+ Returns expected in 1994.

Appendix H. Fish feed purchased at the Sandpoint Hatchery, 1993.

Brand	Size	weight (lbs)	Cost (including shipping)
Bioproducts	Starter 2	88	95.00
Bioproducts	Starter 3	220	227.00
Bioproducts	Biodry4000 1.3	150	105.00
Bioproducts	Biodry4000 1.5	500	300.00
Bioproducts	Biodry4000 2.0	250	120.00
Bioproducts	Biodry4000 2.5	1,250	687.50
Bioproduts	Biodry4000 4.0	250	137.50
Bioproducts	Biodry4000 5.0	432	267.33
Bioproducts	Brood 8.0	176	136.47
Rangen	Salmon 1/16"	50	37.40
Biokyowa	250, 400, 1000um	3	47.88
Subtotal		3,369	2,161.08
Donated Fish Feed (Lake Pend Oreille Idaho Club, LPOIC)			
Bioproducts	Biodiet 2.5	264	155.76
Bioproducts	Biodiet 3.0	528	242.88
Bioproducts	Biodiet 5.0	1,012	457.76
Bioproducts	Biodry4000 3.0	3,000	1,650.00
Subtotal		4,804	2,048.72
TOTALS		8,173	$4,209.72

Appendix I. Result summary on the effects of third summer growth rates maturation schedules of kokanee males.

	Slow				Fast			
	Vat 7		Vat 18		Vet 8		Vat 17	
	Immature	Mature	Immature	Mature	Immature	Mature	Immature	Mature
Start: Number	45	63	41	62	41	76	40	52
Mortality	0	4	2	2	0	8	1	6
End: Number	45	59	39	60	41	68	39	46
Percent Mature	58.3		60.2		65.0		56.5	
Start: Mean Fork Length (cm)	23 (3)		23 (2)		23 (2)		23 (2)	
End: Mean Fork length (cm)	24 (2)	27 (3)	23 (2)	26 (3)	29 (2)	34 (3)	30 (2)	32 (2)
Start: Mean Weight (g)	148 (41)		134 (36)		143 (37)		134 (40)	
Start: K-factor (10^{5})	1.126 (0.083)		1.146 (0.072)		1.140 (0.077)		1.121 (0.094)	
Sept. 29 1993 K-Factor (10^{5})	1.021		1.013		1.237		1.200	
*End; Near Weight (g)	141	201	123	178	302	i86	324	393

* Weight estimated from Sept. 29, 1993 K-factor
Number in parenthesis is one standard error

Appendix J. Result summary on the effects of third summer growth rates on maturation scehudles of kokanee females.

	Slow				Fast			
	Vat 7		Vat 18		Vat 8		Vat 17	
	Immature	Mature	Immature	Mature	Immature	Mature	Immature	Mature
Start: Number	46	29	50	38	60	21	60	38
Mortality	0	2	0	1	0	2	2	3
End: Number	46	27	50	37	60	19	58	35
Percent Mature	38.7		43.2		25.9		38.8	
Start: Fork Length (cm)	23 (3)		23 (2)		23 (2)		23 (2)	
End: Fork Length (cm)	23 (2)	26 (2)	23 (2)	26 (2)	29 (3)	32 (2)	28 (3)	32 (2)
Start: Weight (g)	148 (41)		134 (36)		143 (37)		134 (40)	
Start K-Factor (10^{-6})	1.126 (0.083)		1.146 (0.072)		1.140 (0.077)		1.121 (0.094)	
Sept. 29 1993 K-Factor (10^{4})	1.021		1.013		1.237		1.200	
*End Height (g)	124	179	123	178	302	405	263	393
Ovary Weight (g)		30 (8.5)		30.0 8.2		65.4 (9.9)		65.7 (12.6)
Egg Size (eggs/g)		23.6 (2.5)		24.0 2.2		19.4 2.7		20 .0 (2.6)
Spawning Fecundity		686 (161)		708 (162)		1254 (156)		1314 (229)

* Weight estimated from K-factor (Piper 1970)
Number in parenthesis is one standard error
There was no significant difference between the two slow vats 7 and 18 for ovary weight (P=0.81), egg size (P=0.88), spawning fecundity (P=0.71), and no significant difference between the two fast vats 17 and 8 for ovary weight (P=0.95), egg size (P=0.36), spawning fecundity (P=0.54); And, when the two slow vats where combine with each other and the two fast combine with each other, there was a significant difference fast and slow treatments for ovary weight (P<.001), egg size (P<0.001), and spawning fecundity (P < 0.001).

IDAHO DEPARTMENT OF FISH AND GAME

ANNUAL REPORT

SAWTOOTH FISH HATCHERY 1993

Prepared by:

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INTRODUCTION

Sawtooth Hatchery is a Lower Snake River Compensation Plan (LSRCP) hatchery and has been in operation since 1985. Although the primary goal of the hatchery is to trap, spawn, rear, and release spring chinook salmon and trap and ship eyed steelhead eggs, a program was initiated in 1990 to stock catchable rainbow trout. During 1993, the hatchery was also involved in an intensive effort to trap cutthroat trout in Yellowbelly Lake, rearing and planting excess steelhead fry, assisting Region 7 personnel with mountain lake plants involving cutthroat, rainbow, and grayling fry, and helping the Fisheries Bureau and regional personnel collect catchable rainbow trout fish stomachs for diet analysis.

In the past, Hayspur Hatchery has either planted the Stanley Basin and surrounding area or supplied fish for this purpose. Again in 1993, Hayspur Hatchery fulfilled the request for catchable rainbow trout by supplying 57,700 fish. Stocking started on June 17 and continued through September 9. Normally the stocking schedule begins the last week of May; however in 1993, the National Marine Fisheries Service (NMFS) would not issue the stocking permit until July 15. NMFS was concerned there was a possibility of catchable-size rainbow trout preying on threatened wild chinook or endangered sockeye smolts in waters of the Salmon River and its tributaries. The hatchery was permitted to plant some lakes prior to July 15. These lakes (Alturas, Pettit, Perkins, Stanley, Cape Horn #2, Little Bayhorse, and Josephus) were either outside the upper Salmon River drainage, or where there was no concern of a possible conflict between catchable rainbow trout and wild salmon smolts.

It should be noted that Redfish Lake and Little Redfish Lake were scheduled to be planted in 1993. However, due to concern over sockeye salmon, these lakes were not planted. The kokanee fishing in Redfish Lake was also closed to prevent any accidental harvest of young sockeye.

The majority of the fish (36,000) were planted in the Salmon River between Hell Roaring Creek and Thompson Creek, while the remaining 21,640 fish were planted in tributaries to the Salmon River and several smaller, accessible lakes in the area (Appendix A). The stocked fish averaged 10 inches in length. A planting schedule was followed which was devised earlier in the year and was similar to schedules in the past. For planning purposes, the river was divided into 4 sections (Appendix B). Stocking sites were determined beforehand based on accessibility to the public, ease of planting, and habitat requirements of the fish.

For the 1994 season, the hatchery would like to put up more signs to show people where fish are routinely plantd. Although stocking site memos are delivered to the local merchants, many people still do not know where these catchables are planted. Bridges and sportsman access points would be good places to install signs.

YELLOWBELLY LAKE PROJECT

Sawtooth Hatchery personnel were also involved with an intensive trapping effort this past year at Yellowbelly Lake. In 1990, 1991, and 1992, westslope cutthroat fry, fingerlings, and catchables were stocked into Yellowbelly Lake to establish a broodstock for statewide egg needs. These fish were from eggs obtained from Washoe State Park Fish Hatchery in Anaconda, Montana and reared at cabinet Gorge Fish Hatchery. We had hoped to obtain our first eggs from these fish in 1993. Gill and trap nets, a Merwin trap, picket weir, and hook-and-line were the various methods used to capture fish but were not very successful. Appendix C is a chronological list of events detailing work at Yellowbelly Lake during the fall of 1992 and spring of 1993.

A total of 24 fish were captured; 20 cutthroat and 4 brook trout. The cutthroat consisted of 7 males, 7 females, and 6 unknown fish that escaped out of the holding pen before they could be examined. One male cutthroat appeared to be a wild fish.

Of the various methods used to capture these fish, gill nets were the most effective, followed by the Merwin trap. The picket weir, trap net, and hook-and-line effort produced no fish.

Only one fish was observed in the inlet stream. The picket weir had been installed approximately 300 feet above the mouth with hopes of capturing the fish as they moved upstream to spawn. Because of the high runoff experienced this past spring, the stream overflowed its banks by several feet, thus making the weir and trap inoperable. The trap was pulled and left out for several weeks. At this time fish could have migrated upstream without being observed or caught.

Of the total of 24 fish captured, 4 died in net pens, 6 escaped, 11 were kept for disease sampling, and 3 were released back to the lake. The four mortalities are thought to be the result of gillnetting stress. These fish were not in very good shape when they were put into the holding pens. The fish that escaped did so by jumping out of the holding pens; further escapes were prevented by installing a cover over the pens.

Disease status of the sampled fish indicated no evidence of Infectious Pancreatic Necrosis Virus (IPN) or Infectious Hematopoistic Necrosis Virus (IHN) in either cutthroat or brook trout; however, Bacterial Kidney Disease (BKD) was diagnosed in both species. Using the ELISA method, five of the eight cutthroat examined had BKD at low levels. Using FAT tests, one brook trout indicated a moderate to high level of BKD infection.

The female cutthroat were ripening up in mid to late June, but the male cutthroat never seemed to mature. There is some possibility that holding the fish in pens could have delayed or retarded sexual maturity in the males.

Recommendations for next years efforts might include:

1. Nighttime gillnetting-with the extreme water clarity, the fish had no trouble detecting and avoiding the gill nets during the day.

2. Keep a daily journal-all notes pertaining to the project need to be organized in one journal to facilitate report writing.

Keep accurate records of air and water temperature.

OTHER FIBS PLANTS

The 1993 steelhead egg take exceeded hatchery needs, so this year excess Pahsimeroi fish were incubated and reared. On August 31, 390,000 steelhead fry at 970/pound were stocked in magic Reservoir. On the same day, 150,000 steelhead fry at 845/pound were hauled to Mormon Reservoir.

It was suggested that alpine lake stocking in the White Cloud Mountains and the Challis National Forest (north) be handled from Sawtooth Hatchery this year. on August 31, the hatchery received 5,000 cutthroat fry at 1,044/pound and 750 rainbow at 600/pound from McCall Hatchery. Mackay Hatchery also supplied 3,000 grayling fry at 1,673/pound. Unfortunately, half of the grayling were lost due to water circulation problems in our holding container. Ashton Hatchery was able to help make up for the loss by sending an additional 4,047 fry at 1,900/pound

the next day. On September 1, the fish were bagged, labeled, and transported to the Stanley Airport where Region 7 personnel loaded and flew them to their destined lakes (48 in all) in the White Cloud Mountains via helicopter. A total of 23,000 cutthroat, 500 rainbow, and 1,250 grayling were planted.

On September 3, the remaining fry were bagged up in a similar fashion and hauled to Challis airport where they were flown to their destination lakes in the Challis National Forest. A total of 250 rainbow, 10,910 cutthroat, and 4,047 grayling fry were planted.

Finally, as a condition of the NMFS Permit No. 869 which allows the hatchery to stock hatchery trout in the upper Salmon River basin, it is required to monitor the catchable rainbow trout diet to estimate salmon consumption in the summer and fall, and also to assess catchable abundance and survival into the winter. During the month of September, Sawtooth personnel assisted with creel surveys, electrofishing trips, and hook-and-line sampling to collect fish stomachs. They also helped with measuring snorkeling transacts and will provide assistance with similar efforts throughout the fall.

Appendix A. Planting sites and numbers of catchable rainbow trout stocked in the Sawtooth Valley and Stanley Basin during June-September 1993.

SITE	NUMBER	SITS	NUMBER
Perkins Lake	2,000	Yankee Fork Ponds	2,000
Pettit Lake	3,500	Yankee Fork River	1,000
Cape Horn Lake 12	500	Stanley Lake Creek	2,000
Josephus Lake (lower)	1,000	Valley Creek	3,000
**Stanley Lake	3,140	Salmon River	36,000
**Little Bayhorse Lake	1,000		
**Alturas Lake	2,500		
		Total - 57,640	

**These lakes are not normally planted by Sawtooth Hatchery.

Appendix B. Boundaries for Salmon River Sections.

Section 8 - Hellroaring bridge downstream to Redfish Lake Creek.

Section 7 - Redfish Lake Creek downstream to Valley Creek.

Section 6 - Valley Creek downstream to Yankee Fork River.

Section 5 - Yankee Fork River downstream to Yankee Fork Ranger Station.

Appendix C. Chronological list of events related to Yellowbelly Lake trapping efforts.

Date	
11-4-92	Floats and weights hauled into Yellowbelly Lake while the road was still open.
3-24-93	Picket weir installed in the inlet stream; trapping begins. Snowmobiles were used for transportation.
3-31-93	No fish, water temperature 33^0F in the stream.
4-7-93	No fish, water temperature 33^0F in the stream. It appeared someone had tampered with the weir. The trap was still working.
4-8-93	Make complete repair to weir and reinforce frames.
4-14-93	No fish, water temperature 33^0F in the stream.
4-21-93	No fish, water temperature 36^0F in the stream. Lake beginning to open up a little. Approximately 30 yards of open water at mouth. No sign of fish activity.
4-27-93	No fish.
5-5-93	No fish. Region 7 fisheries personnel into Yellowbelly to check things out.
5-12-93	No fish, water temperature 40°F in stream.
5-19-93	Drove truck as far as fish barrier then walked the rest of the way. The water is up a couple feet and the weir is submerged. The weir is pulled and stored nearby, above the water line.
5-26-93	Drove clear into the lake, inlet stream still very high, water temperature 40^0F. Ice is mostly gone from the lake.
6-1-93	Set gill and trap net with Region 7 personnel. Caught 3 cutthroat, none ripe. Lots of fish rising, water temperature 46^0F in the stream. Lake shore temperature 52°F.
6-2-93	Continue to set gill and trap nets, caught 3 more cutthroat.
6-7-93	Installed Merwin trap with no wings. Trap nets in operation and set gill nets.
6-8-93	Merwin trap and trap nets trapping. Caught 3 brook trout in the Merwin trap. Set gill nets, no fish.
6-10-93	Check traps and set nets. Install cover on net pens. Caught at least 7 cutthroat; 5 males, 2 females.
6-14-93	Check traps and set nets.
6-17-93	Reinstall picket weir on inlet stream. One mortality, female 10 3/4 inches, IV clip.

6-21-93 Check picket weir, no fish. Water temperature 48^{0}F in stream. one cutthroat in Merwin trap, one mortality.

6-24-93 Check trap and weir, no fish. Water temperature 48^{0}F in the stream.

6-28-93 Check trap and weir, no fish.

7-1-93 Close down all the traps.

7-2-93 Haul out all remaining trap equipment and work up disease samples.

****** Not sure when the remaining 7 fish were caught.******

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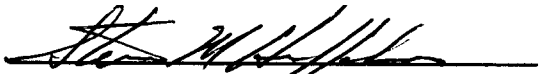

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